

AD-A154 498 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
BIGNEY POND DAM (MA 0. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV DEC 78

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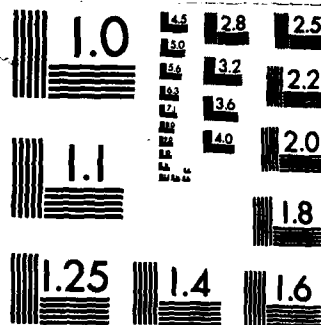
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MASSACHUSETTS—RHODE ISLAND COASTAL BASIN
BROCKTON, MASSACHUSETTS

AD-A154 498

BIGNEY POND DAM
MA 00422

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Bigney Pond Dam is formed by an approximately 180 ft. length of earth embankment confined by vertical stone masonry retaining walls about 11 ft. high. The Dam is in good condition. It has a low hazard potential and is small in size. The city of Brockton should implement remedial measures.		

MASSACHUSETTS - RHODE ISLAND COASTAL BASIN
BROCKTON, MASSACHUSETTS

BIGNEY POND DAM

MA 00422

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

DECEMBER 1978



PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM

Identification No.:	MA 00422
Name of Dam:	Bigney Pond
Town:	Brockton
County:	Plymouth
State:	Massachusetts
Stream:	Dorchester Brook
Date of Site Visit:	4 October 1978

BRIEF ASSESSMENT

Bigney Pond Dam is formed by an approximately 180 ft. length of earth embankment confined by vertical stone masonry retaining walls about 11 ft. high. The crest of the dam is Torrey Street, a paved secondary road. A 7 ft. long spillway outlet structure with provisions for 9 ft. of flashboards controls flow through the dam. A culvert located about 300 ft. left of the spillway would convey some overflow from the pond under Torrey Street. Bigney Pond has a maximum storage capacity of 12 acre-feet and is used for recreational purposes.


Bigney Pond Dam was formerly classified as having a "high" hazard potential on the Corps of Engineers National Inventory of Dams. Due to the lack of downstream development, however, the dam has been reclassified as having a "low" hazard potential in the event it were to fail.

The dam is in good condition, based on visual examination of the structure. Although some deficiencies were noted, there was no evidence of settlement, lateral movement or other signs of structural failure or other conditions which would warrant urgent remedial action.

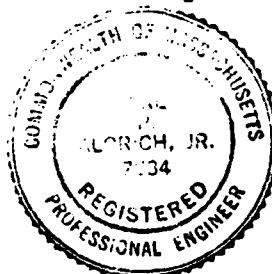
Based on size (small) and hazard (low) classifications in accordance with Corps of Engineers guidelines, the test flood for this dam is the 100-year flood. The test flood outflow of 1180 cfs (255 csm) would not overtop the dam itself, but would overtop a 185-ft. long section of Torrey Street in the vicinity of the culvert by an estimated maximum depth of 1.2 ft. With the water level at the test flood pool, the spillway outlet without flashboards can pass 580 cfs which is 49 percent of the test flood outflow.

The City of Brockton, owner of the dam, should implement remedial measures, including clearing brush and trees, repairing masonry and concrete and renovating the timber railing as outlined in Section 7.3 within two years after receipt of this report.

HALEY & ALDRICH, INC.
by:



Earl Aldrich
President



PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, DC 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm run-off), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment

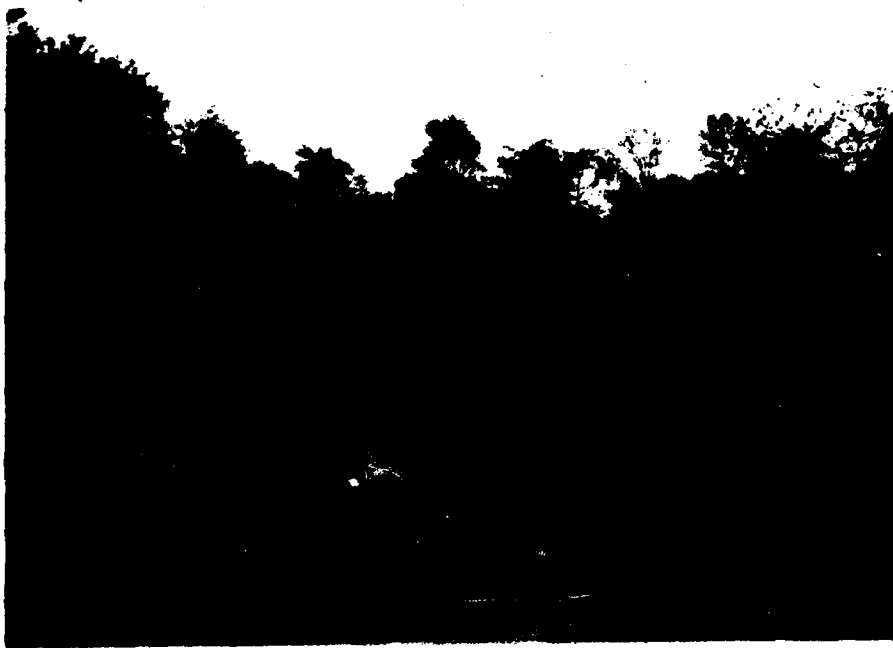
of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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1. Overview of upstream face of dam



DAM: Bigney Pond

IDENTIFICATION NO. MA 00422

LOCATION MAP
USGS QUADRANGLE
BROCKTON, MA.

APPROX. SCALE: 1" = 2000'

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM
BIGNEY POND DAM
MA 00422

SECTION 1 - PROJECT INFORMATION

.1 GENERAL

A. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England region.

Haley & Aldrich, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed were issued to Haley & Aldrich, Inc. under a letter dated 26 April 1978 from Colonel Ralph T. Garver, Corps of Engineers. Contract No. DACW33-78-C-0301 has been assigned by the Corps of Engineers for this work. Camp, Dresser & McKee, Inc. was retained as consultant to Haley & Aldrich, Inc. on the structural, mechanical/electrical and hydraulic/hydrologic aspects of the Investigation.

B. Purpose. The primary purposes of the National Dam Inspection Program are to:

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

3. To update, verify and complete the National Inventory of Dams.

.2 PROJECT DESCRIPTION

A. Location. The embankment for Bigney Pond dam is Torrey Street, located at the southern tip of Bigney Pond about one-half mile west of Route 24 in Brockton, Massachusetts, as shown on the Location Map, page viii. Discharge from the dam is conveyed by Manchester Brook southward.

B. Description of Dam and Appurtenances. Bigney Pond dam is formed by an approximately 180-ft. length of earth embankment confined by vertical stone masonry retaining walls about 11 ft. high. These walls have a reinforced concrete cap and timber railing. The crest of the dam is 48 ft. wide. The Torrey Street pavement runs the length of the crest.

A 7-ft. long spillway outlet structure with guide slots for flashboards up to 9 ft. in height is located on the upstream side of the dam. Discharge over the spillway passes through a 9.5-ft. wide by 6.2-ft. high rectangular conduit under Torrey Street.

Left of the spillway outlet, along the edge of the pond at normal water level, there is an earthen ridge containing some boulders, the top elevation of which is somewhat below the roadway level. Water overtopping this ridge would flow eastward through the woods before it would cross underneath Torrey Street through a 7.75-ft. wide by 3.5-ft. high overflow culvert approximately 300 ft. east of the spillway outlet.

The configuration of the dam and appurtenances is shown on the "Site Plan Sketch", Appendix C-1.

C. Size Classification. Bigney Pond has an estimated maximum storage of 12 acre-feet and the dam embankment has a maximum height of approximately 11 ft. Storage of less than 1000 acre-feet and a height of less than 40 ft. classifies this dam in the "small" size category, according to guidelines established by the Corps of Engineers.

D. Hazard Classification. Bigney Pond was formerly classified as having a "high" hazard potential in the Corps of Engineers National Inventory of Dams. However, dam failure analysis computations, Appendix D-16, which are based on "Guidance for Estimating Downs from Dam Failure Hydrograph" demonstrate why this dam was reclassified to a lower classification. Calculations show that by the time the flows generated by a dam failure reach point 1300 ft. downstream of the pond, they will have been entirely dissipated because of the large amount of storage available in this reach. There appear to be no structures which would be damaged by flood waters. A dam failure implies that a section of Torrey Street would be washed out. However, since no loss of life

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

1 DAM ASSESSMENT

A. Condition. The visual examination of Bigney Pond m revealed that the structure was in good condition. though there were no signs of structural failure or other nditions which would warrant urgent remedial action, several nor deficiencies were noted.

Based on the results of computations included in Appendix and described in Section 5, the spillway is not capable of ssing the test flood, which for this structure is the 100-year ood. The test flood outflow of 1180 cfs (255 csm) would not ertop the dam itself, but would overtop a 185-ft. long section Torrey Street in the vicinity of the overflow culvert by estimated maximum depth of 1.2 ft. With the water level the test flood pool, the spillway outlet can pass 580 cfs ich is 49 percent of the test flood (with no flashboards in).

B. Adequacy of Information. A review of design and nstruction data is a highly desirable factor in developing thorough Phase I assessment. However, there was insufficient ineering data available for this dam to allow for such a view. The evaluation of the dam is therefore based primarily visual inspection, past performance and engineering judgement.

C. Urgency. The remedial measures outlined in Section 3 should be undertaken by the Owner and completed within o years after receipt of this report.

D. Need for Additional Investigation. Additional investi- tion is not believed to be necessary at this time.

2 RECOMMENDATIONS

Not applicable.

3 REMEDIAL MEASURES

A. Operation and Maintenance Procedures. It is recom- nded that the following work be undertaken by the Owner to rrect deficiencies noted during the visual examination:

1. Cut all brush and trees within the channel upstream and immediately downstream of the overflow culvert. The channels should be cleared of all brush at least once each year.

D. Post-Construction Changes. With the exception of flashboard area in the spillway, the observed type of construction for the spillway outlet and the overflow culvert are to be of the same vintage. The condition of the concrete the use of concrete at the flashboard area indicates that portion of the structure may have been added after the initial dam was constructed or that the area has been rehabilitated.

E. Seismic Stability. A theoretical analysis for seismic stability of the spillway and overflow culvert outlets is not possible due to the lack of pertinent design data. The outlets located in a Zone 3 seismic risk area. Although the structures are quite small and appear to be in good condition with no indication of instability, it is not practical to evaluate the seismic stability of the structures for the same reasons given in section 6.1E.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF EMBANKMENT STRUCTURAL STABILITY

A. Visual Observations. There was no visual evidence of lateral movement or distress in the embankment retaining walls and no observed settlement or cracking of the pavement on the crest that would indicate instability.

B. Design and Construction Data. No records or drawings related to the design or construction of the embankment are available.

C. Operating Records. There are no records of survey pins or other instruments installed in the dam to indicate the magnitude and nature of any past structural movements.

D. Post-Construction Changes. The year in which the dam was constructed is unknown. There is no indication from prior inspection reports that any changes to the dam have been made since 1937.

E. Seismic Stability. Bigney Pond dam is located in Seismic Zone 3. The stability of the embankment during an earthquake is unknown. Settlement of the crest and cracking or movement of the retaining walls are dependent on the backfill soils present and the configuration of the walls.

While a Zone 3 earthquake event would cause some shifting in the backfill, subsequent settlement of the pavement, and possible damage to the retaining walls, it is unlikely the dam would fail. Furthermore, this dam has a "low" hazard potential and the pond elevation is normally low. For these reasons, a seismic analysis is not justified.

6.2 EVALUATION OF SPILLWAY STRUCTURAL STABILITY

A. Visual Observations. There was no visual evidence of movement or distress in the spillway outlet or the overflow culvert structures.

B. Design and Construction Data. A theoretical structural analysis of the outlet structures was not possible due to the lack of pertinent data. The evaluation of the structural stability of the outlets, therefore, must be based on the visual observations.

C. Operating Records. No operating records are known to exist for the spillway or culvert outlets.

be overtopped for a length of approximately 185 ft. and to an estimated maximum depth of 1.2 ft. Therefore, although the spillway alone is not capable of handling the test flood, in combination with the culvert, the dam can contain the test flood with only a moderate amount of overtopping of the road.

E. Evaluation. The spillway is not capable of handling the 100-year flood flows. A failure of the dam is not expected to cause significant downstream structural damage and loss of life. It appears that the only effect of a breach of the dam would be the local damage occurring to Torrey Street itself.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

A. Design Data. No construction or record plans were found for Bigney Pond dam. No hydraulic nor hydrologic design data were found. The recommended test flood for the size (small) and hazard potential (low) of this dam is the 100-year frequency.

B. Experience Data. Mr. Sam Sergio, foreman, has been with the Brockton Highway Department since 1946. He does not know of anyone ever removing or adding flashboards at the Bigney Pond dam spillway. He believes that a section of Torrey Street was overtopped once in the past 32 years, probably during the 1955 hurricane. The height of the flashboards then is unknown.

The "SCS TP-149, Method for Estimating Volume and Rate of Runoff in Small Watersheds" was used as a guide for determining the inflow hydrograph into Bigney Pond for the 100-year storm (5.9 inches of rainfall in 12 hours). The peak inflow was calculated to be 1180 cfs. Because of the minute amount of storage available, the peak outflow is 1180 cfs at the pond water surface elevation of 107.85, about 2 ft. below the top of the dam.

C. Visual Observations. The inspection revealed that an earthen dike or ridge exists left (east) of Bigney Pond and extends perpendicular to Torrey Street, approximately 200 ft. upstream where it appears to blend in with existing ground. The low point of the dike is estimated to be at El. 106.7. It appears that if the water surface of the pond rises to a value greater than that of the dike, the waters would flow overland in an easterly direction and be conveyed under Torrey Street by a stone culvert located 317 ft. east of the centerline of the dam.

Downstream of the dam, a wide flood plain exists for approximately 4600 ft. until Pearl Street crosses the brook. At this point there exists a moderate amount of residential development as well as a U.S.G.S. Gaging Station No. 01107000, where flow records have been obtained since October 1962.

D. Overtopping Potential. As stated previously, based on the size (small) and hazard (low) classifications published in the Guidelines, the test flood is the 100-year storm. A rating curve for the dam's outlets (the spillway at the dam and the overflow culvert) was developed and analysis demonstrated that at a flow of 1180 cfs, the pond's water surface will be approximately El. 107.85. At this elevation, the spillway will pass an estimated 580 cfs (with no flashboards in place). However, due to overflow eastward from the pond, the section of Torrey Street which passes over the aforementioned culvert will

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There is no established routine for the operation of the dam.

4.2 MAINTENANCE OF THE DAM

There is no established formal maintenance program for this dam.

4.3 MAINTENANCE OF OPERATING FACILITIES

With the exception of flashboards at the spillway outlet, this dam has no operating facilities. Flashboards are inserted or removed to establish a desired pond level. Approximately 4.2 ft. of flashboards were believed in place during the site examination. To the best knowledge of the Brockton Highway Department, the flashboards have not been operated in over 30 years.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no established warning system or emergency preparedness plan in effect for this structure.

4.5 EVALUATION

A periodic observation and maintenance program should be established to examine the dam, control tree and bush growth and maintain walls and channels. The Owner should be prepared to remove flashboards from the outlet structure if necessary.

respectively. Downstream of Torrey Street, the channel invert contains cobbles and vegetation. The banks and portions of the channel contain heavy brush and young trees.

3.2 EVALUATION

The dam and appurtenant structures are considered to be in good condition, based on the observations made on 4 October 1978. The minor deficiencies noted should not have any serious effect on the performance of the dam.

The overflow culvert structure consists of approach walls and a culvert underneath Torrey Street, shown in Photo No. 9. Mortared stone masonry was used in the upstream and downstream channel walls. The approach walls are constructed of what appears to be granite curbing mortared in place. The upstream headwall and downstream headwall are constructed of mortared fieldstone walls.

A portion of the stone appears to be missing on the left upstream channel wall, Photo No. 9. Both upstream and downstream fieldstone walls have local spots of efflorescence. The concrete beam forming the top of the culvert on both the upstream and downstream faces also exhibits some minor efflorescence. The railing above both ends of the culvert needs painting. Otherwise, the structure is considered to be in good condition.

Both the approach channel, Photo No. 8, and the downstream channel of the overflow culvert structure have heavy vegetation present. These channels should be cleaned of trees and brush.

D. Reservoir Area. The area around Bigney Pond is almost entirely wooded and the topography is relative flat, Photo No. 10. The shallow bottom and marshy shoreline near the dam indicate some sedimentation has taken place.

E. Downstream Channel. A pond has formed immediately downstream of Torrey Street due to the remains of an old dam located approximately 100 ft. downstream of the main outlet culvert. This dam, shown in Photo No. 11, includes a concrete outlet structure on the left end with 5 or 6 planks in place in the flashboard slots. This dam, apparently in poor condition, is currently holding Bigney Pond at its present water surface elevation.

A stone wall, partially collapsed, is located right of the outlet of the old dam. The top elevation of this portion is perhaps 1 to 2 ft. below the crest of the concrete at the outlet structure. To the right of the stone wall, there is a concrete block spillway about 12 ft. long which is also at an elevation lower than the concrete at the outlet. Downstream of the structure there are numerous fragments of broken rock, boulders, timber, logs, debris and other obstructions in the downstream channel.

The overflow channel from the earthen ridge (dike) left of Bigney Pond to the Torrey Street overflow culvert is heavily vegetated by brush, trees and grass, Photos No. 6 and 8,

SECTION 3 - VISUAL EXAMINATION

3.1 FINDINGS

A. General. The Phase I visual examination of the Bigney Pond dam was conducted on 4 October 1978. The water level in the pond was relatively low, approximately 2 ft. below the water mark stained on the faces of the dam.

In general, the project was found to be in good condition. A few deficiencies which require correction were noted.

A visual inspection check list is included in Appendix A and selected photographs of the project are given in Appendix C. A "Site Plan Sketch", Appendix C-1, shows the layout of the project and the location from which each photograph was taken.

B. Dam. Vertical fieldstone masonry walls form the upstream and downstream faces of the dam, Photos No. 2 and 3. The joints in the walls, especially the lower joints, have started to deteriorate. Some minor vegetation was noted in the joints. Several stones are missing from the upstream face of the dam. Otherwise, the masonry facing for the dam is in good condition.

A concrete cap supporting timber railing is present at the top of the masonry walls. Minor deterioration of the upstream concrete cap was noted. Reinforcing bars were exposed for approximately 15 ft. in a section of the downstream concrete cap. Sections of the railing are broken on the upstream side of the dam and the railings on both the downstream and upstream sides need repainting.

The crest of the dam is the paved Torrey Street roadway, shown in Photo No. 7. The road slopes downward to the east, at approximately a 3 percent grade from Bigney Pond to the overflow culvert. The pavement is in excellent condition, showing no signs of settlement, cracking, or lateral movement of the embankment.

C. Appurtenant Structures. The spillway outlet structure is constructed of mortared stone and concrete, Photos No. 4 and 5. Minor vegetation was observed in the joints. The concrete beam over the upstream end of the culvert which forms the spillway chute has some slight deterioration. The concrete guide slots are clear for insertion or removal of flashboards. The top plank of the 4.2 ft. of flashboards believed to be presently forming the spillway was visible 3 in. below the water surface. The spillway structure, in general, appears to be in good condition.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN RECORDS

No design records are available for this dam.

2.2 CONSTRUCTION RECORDS

No construction records are available for this dam.

2.3 OPERATING RECORDS

The only operating records available are prior inspection reports by state and county agencies dating back to 1937.

2.4 EVALUATION

A. Availability. A list of the engineering data available for use in preparing this report is included in Appendix B-1. Copies of the documents from the listing are also included in Appendix B.

B. Adequacy. A review of design and construction data is a highly desirable factor in developing a thorough Phase I assessment. However, there was insufficient engineering data available for this dam to allow for such a review. The evaluation of the dam is therefore based primarily on visual inspection, past performance and engineering judgement.

C. Validity. There is no reason to doubt the validity of the available data.

- 6. Zoning..... Unknown
- 7. Impervious core..... Unknown
- 8. Cutoff..... Unknown
- 9. Grout curtain..... Unknown
- 10. Other..... Crest is Torrey
Street roadway

H. Diversion and Regulating Facilities. Not applicable.

I. Spillway

- 1. Type..... Concrete chute; spillway is formed by adding up to 9 ft. of flashboards
- 2. Length of weir..... 7 ft.
- 3. Crest elevation..... 98.7 with no flashboards in place
- 4. Gates..... None (flashboards totaling 4.3 ft. in height in place)
- 5. U/S channel..... Unknown
- 6. D/S channel..... 0.3 percent (Est.)

J. Regulating Outlets. There are no regulating gates for this facility. The upstream pond level is regulated by the addition of flashboards at the spillway. The crest of the spillway without flashboards is approximately El. 98.7. The use of the maximum amount of flashboards would raise the crest to approximately El. 107.7. The length of the area capable of receiving flashboards is approximately 7 ft.

3. Design surcharge - original design..... Unknown
4. Full flood control pool..... Not applicable
5. Recreation pool..... Top of flashboards at El. 102.9 on 4 October 1978
6. Spillway crest
 (without flashboards)..... 98.7
 (with flashboards)..... 107.7 maximum
7. Upstream portal invert diversion tunnel..... Not applicable
8. Streambed at centerline of dam..... 98.7
9. Maximum tailwater..... Unknown

D. Reservoir

1. Length of maximum pool..... 0.13 mi. (Est.)
2. Length of recreation pool... 0.13 mi. (Est.)
3. Length of flood control pool..... Not applicable

E. Storage (acre-feet)

1. Top of dam..... 12
2. Test flood pool..... 10
3. Flood control pool..... Not applicable
4. Recreation pool..... 4
5. Spillway crest
 (without flashboards)..... 0
 (with flashboards)..... 8.5 maximum

F. Reservoir Surface (acres)

1. Top of dam..... 3.2
2. Test flood pool..... 3.1
3. Flood control pool..... Not applicable
4. Recreation pool..... 3
5. Spillway crest
 (without flashboards)..... 0
 (with flashboards)..... 3 maximum

G. Dam Embankment

1. Type..... Backfill between two fieldstone masonry retaining walls
2. Length..... 180 ft.
3. Height..... 11 ft.
4. Top Width..... 48 ft.
5. Side Slopes..... Vertical

A. Drainage Area. The drainage area of Bigney Pond is approximately 4.62 square miles (2957 acres). The pond surface itself comprises an estimated 0.11 percent (3.2 acres) of the total drainage area. The watershed's topography is primarily flat terrain with large portions of marshland along the course of Dorchester Brook.

Dorchester Brook rises in a swampy area about 3 miles north of Bigney Pond in neighboring Stoughton. After flowing through French Pond and Monte Pond as well as swampy areas upstream of each, Dorchester Brook enters Bigney Pond after which it combines with Daley Brook one mile downstream to become Coweaset Brook, a tributary of the Hockomock River. Although several housing developments exist throughout the upper reaches of the watershed, overall development of the watershed is moderate to sparse. Only sparse development surrounds Bigney Pond.

B. Discharge at Dam Site

1. Outlet Works..... No outlets other than spillway and overflow culvert
2. Maximum known flood at dam site since October 1962..... 359 cfs on 18 March 1968
3. Ungated spillway capacity at top of dam..... 760 cfs at El. 110.0
4. Ungated spillway capacity at test flood pool elevation..... 580 cfs at El. 107.85
5. Gated spillway capacity at normal pool elevation.. Not applicable
6. Gated spillway capacity at test flood pool elevation..... Not applicable
7. Total spillway capacity at test flood pool elevation..... 580 cfs at El. 107.85
8. Total project discharge at test flood pool elevation..... 1180 cfs at El. 107.85

C. Elevation (ft. above MSL)

1. Top of dam..... 110 (Assumed)
2. Test flood pool - design surcharge..... Unknown

would occur, nor significant damage to industrial, commercial, and residential structures, this dam should be reclassified as having a "low" hazard potential.

E. Ownership. The name and address of the current owner are:

City of Brockton
Department of Public Works
Highway Division
456 Montello Street
Brockton, MA 02401
(Phone: (617) 587-9100)

The water rights and adjacent property are owned by the Young Men's Hebrew Association, 71 Legion Parkway, Brockton, MA 02401 (Phone: (617) 586-6404). The property was purchased in the mid-1950's from the Stone Charitable Foundation. A 1937 inspection report lists Mr. George W. Bigney as owner of the dam.

F. Operator. Mr. Timothy Sullivan, Superintendent, Brockton Highway Division, is ultimately responsible for operation and maintenance of the dam.

G. Purpose. Bigney Pond is used during the summer months as a family recreation area operated by the Young Men's Hebrew Association. However, no apparent attempt has been made to regulate the pond level by use of the flashboards at the spillway outlet. On 4 October 1978, water level in Bigney Pond was very low, about 3 inches above one visible flashboard in the spillway. The water level was, in fact, being controlled by an old dam located approximately 100 ft. downstream (south) of Torrey Street.

H. Design and Construction History. No information on the design and construction of Bigney Pond dam is available. The Brockton Highway Department has no records of when the dam was constructed. Presumably it has existed since at least 1900.

I. Normal Operational Procedures. There are no established normal operating procedures for this dam. The level of Bigney Pond could be regulated by the insertion and removal of flashboards, but this has reportedly not been done for at least the past 32 years.

1.3 PERTINENT DATA

In the absence of any datum information, the elevation of the top of Torrey Street at the centerline of the spillway structure was assumed to be 110 ft. (MSL) using the U.S.G.S. Brockton, Massachusetts quadrangle. All other elevations reported herein were measured relative to this assumed datum.

2. Repoint the joints in the masonry as necessary and replace missing stones.
3. Repair deteriorated concrete cap beams by removing all loose concrete and patching as necessary.
4. Repair broken areas in the railing and repaint all railings.

Although the dam is currently in good condition, it is considered important that the Owner prepare an operations and maintenance manual for the dam. The manual should include provisions for biennial technical inspection of the dam and for surveillance of the dam during periods of heavy precipitation and high reservoir water levels. The procedures should delineate the routine maintenance work to be done on the dam to ensure satisfactory operation and to minimize deterioration of the facility.

7.4 ALTERNATIVES

Not applicable.

WATERWAY CONSTRUCTION

WATERWAY CONSTRUCTION

WATERWAY CONSTRUCTION

A-2

**Outlet Works-Drillway Outlet, Approach
and Discharge Channel**

A-3

Outlet Works-Drillway Culvert

A-4

VISUAL INSPECTION PARTY ORGANIZATION

NATIONAL DAM INSPECTION PROGRAM

Dam: Bigney Pond

Date: 4 October 1978

Time: 1145-1345

Weather: Partly Cloudy and Warm (60's F.)

Water Surface Elevation Upstream: El. 103.2 MSL

Stream Flow: Very slight through spillway culvert

Inspection Party:

Harl P. Aldrich, Jr.	- Soils/Geology
Haley & Aldrich, Inc.	
Roger H. Wood	- Structural/Mechanical
Camp, Dresser & McKee, Inc.	
Charles E. Fuller	- Hydraulic/Hydrologic
Camp, Dresser & McKee, Inc.	

Present During Inspection:

Barry Koretz, Young Men's Hebrew Association
Richard A. Brown, Haley & Aldrich, Inc.
Donna L.B. D'Amore, Camp, Dresser & McKee, Inc.

VISUAL INSPECTION CHECK LIST NATIONAL DAM INSPECTION PROGRAM

DAM: Bigney Pond

DATE: 4 Oct. 78

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
1. <u>General</u>	
a. Crest Elevation	110.0, top of Torrey Street roadway
b. Current Pool-Elevation	103.2
c. Maximum Impoundment to date	Unknown, street has been overtopped in past
2. <u>Crest</u>	
a. Surface Cracks	None
b. Pavement Condition	Excellent
c. Movement or Settlement of Crest	None apparent
d. Lateral Movement	None apparent
3. <u>Wall (Upstream Face of Dam)</u>	
a. Vegetation	Minor vegetation growth in joints
b. Seepage or Efflorescence	None observed
c. Rust or Stains	None observed
d. Cracks	None observed
e. Condition of Joints	Lower joints deteriorated
f. Spalls, Voids or Erosion	Several stones missing, some deterioration of concrete cap
g. Visible Reinforcement	None observed
h. General Structure Condition	Good condition
i. Railing	Railing requires maintenance
4. <u>Wall (Downstream Face of Dam)</u>	
a. Vegetation	Minor vegetation growth in joints
b. Seepage or Efflorescence	None observed
c. Rust or Stains	None observed
d. Cracks	None observed
e. Condition of Joints	Lower joints started to deteriorate
f. Spalls, Voids or Erosion	Deterioration of concrete cap
g. Visible Reinforcement	Reinforcing bars in concrete cap exposed in one 15-ft. section

FILE NO. 4160

HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

A-2

VISUAL INSPECTION CHECK LIST NATIONAL DAM INSPECTION PROGRAM

DAM: Bigney Pond DATE: 4 Oct. 78

AREA EVALUATED	CONDITION
<p>h. General Structure Condition</p> <p>i. Railing</p> <p><u>OUTLET WORKS - SPILLWAY</u> <u>OUTLET, APPROACH AND</u> <u>DISCHARGE CHANNELS</u></p> <p>1. <u>Approach Channel</u></p> <p>a. General Condition</p> <p>b. Obstructions</p> <p>c. Log, Boom, etc.</p> <p>2. <u>Spillway Outlet</u></p> <p>a. Flashboards</p> <p>b. Weir Elev. Control (Gate)</p> <p>c. Vegetation</p> <p>d. Seepage or Efflorescence</p> <p>e. Rust or Stains</p> <p>f. Cracks</p> <p>g. Condition of Joints</p> <p>h. Spalls, Voids or Erosion</p> <p>i. Visible Reinforcement</p> <p>j. General Structural Condition</p> <p>3. <u>Discharge Channel</u></p> <p>a. Apron</p> <p>b. Stilling Basin</p> <p>c. Channel Floor</p> <p>d. Vegetation</p> <p>e. Seepage</p> <p>f. Obstructions</p> <p>g. General Structural Condition</p>	<p>Good condition</p> <p>Railing requires maintenance</p> <p>Spillway adjacent to pond - no approach channel</p> <p>Minor debris - some boulders adjacent to inlet</p> <p>None</p> <p>Flashboards 7 ft. wide, 9 ft. high max.</p> <p>Flashboards control height of pond</p> <p>Minor vegetation lower portion</p> <p>None observed</p> <p>None observed</p> <p>None observed</p> <p>Good</p> <p>None observed</p> <p>None observed</p> <p>Good condition - see <u>DAM EMBANKMENT</u> Items 3 and 4 for condition of walls at face of dam</p> <p>None</p> <p>None</p> <p>Area downstream is another pond with its own dam</p> <p>None observed</p> <p>None observed</p> <p>None observed - dam downstream</p> <p>Good</p>

A-3

VISUAL INSPECTION CHECK LIST NATIONAL DAM INSPECTION PROGRAM

DAM: Bigney Pond

DATE: 4 Oct. 78

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OVERFLOW CULVERT</u>	
1. <u>Approach Channel</u>	
a. General Condition	Fair, natural ground
b. Obstructions	Heavy vegetation
c. Log Boom, etc.	None
2. <u>Weir</u>	
a. Flashboards	None
b. Weir Elevation Control (Gate)	Flow over earth mound upstream
c. Vegetation	Heavy vegetation
d. Seepage or Efflorescence	Minor
e. Rust or Stains	None observed
f. Cracks	None observed
g. Condition of Joints	None observed
h. Spalls, Voids or Erosion	None observed
i. Visible Reinforcement	None observed
j. General Structural Condition	Good
3. <u>Discharge Channel</u>	
a. Apron	None observed - natural growth
b. Stilling Basin	None
c. Channel Floor	Natural ground
d. Vegetation	Heavy growth - brush with some trees
e. Seepage	None observed
f. Obstructions	Vegetation
g. General Structural Condition	Fair
4. <u>Left and Right Approach Walls</u>	
a. Vegetation	Trees and brush overhanging
b. Seepage or Efflorescence	Efflorescence downstream - minor
c. Rust or Stains	None observed
d. Cracks	None observed

**VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM**

DAM: Bigney Pond

DATE: 4 Oct. 78

AREA EVALUATED

CONDITION

- e. Condition of Joints
- f. Spalls, Voids or Erosion
- g. Visible Reinforcement
- h. General Structural Condition
- i. Railing

Good
Stone missing on left wall

None observed
Good

Needs maintenance and repainting

1975-1976

1977-1978

1979-1980
1981-1982
1983-1984

1985-1986
1987-1988
1989-1990

1991-1992
1993-1994
1995-1996

LIST OF AVAILABLE DOCUMENTS
BIGNEY POND DAM

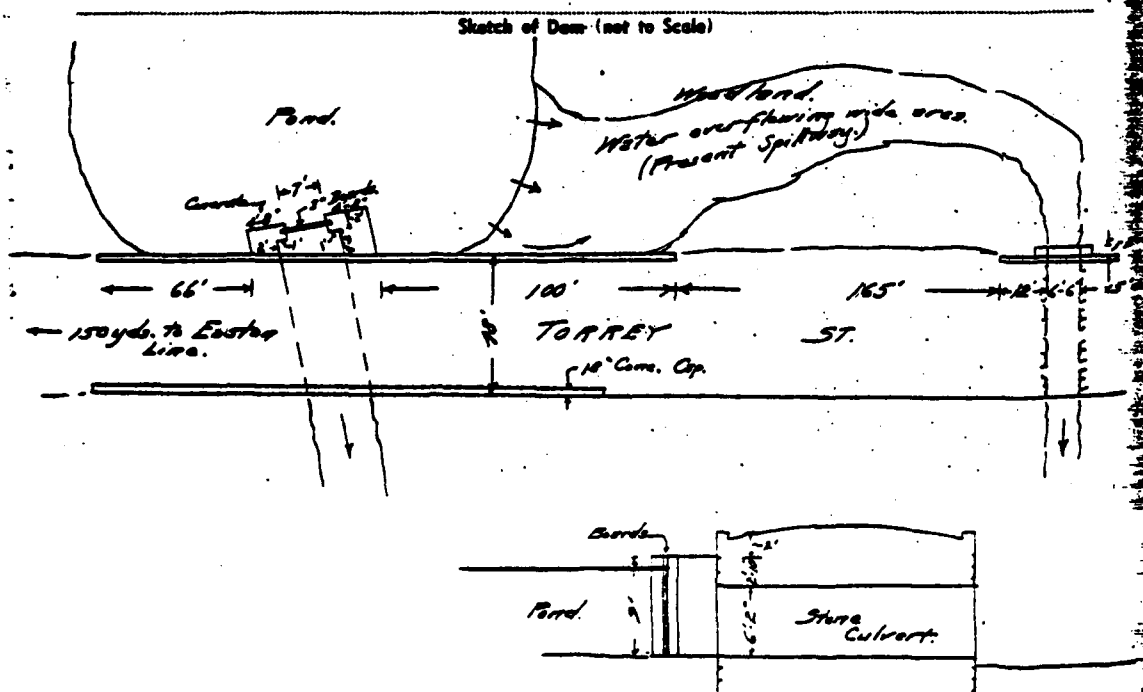
<u>DOCUMENT</u>	<u>CONTENTS</u>	<u>LOCATION</u>
County inspection report	Summary of the 18 inspections made from 4 January 1937 through October 1968, sketch of the dam and two photographs	Massachusetts Department of Environmental Quality Engineering, Division of Waterways, 100 Nashua Street, Boston, MA 02214 and Appendix B-2
State inspection reports	Two reports of inspections made on 5 December 1972 and 25 June 1975	Massachusetts Department of Environmental Quality Engineering and Appendix B-4

COUNTY OF PLYMOUTH, MASSACHUSETTS
ENGINEERING DEPARTMENT
INSPECTION OF DAM AND RESERVOIRS

DAM NO. 129

By Bamber & Gfrerer Date Jan. 4, 1937 City or Town Brockton
Location Tarrey Street near Eastern Line
Owner George W. Bigney Use Ice Pond
Material and Type Tarrey St. forms dam. Earth fill with stone facing and concrete capping (new work)
Height in Feet (Full Pond Level to Bottom of Spillway) 2 feet
Length 130 feet ± Width 18 feet
Area of Watershed 5 Square Miles Capacity 2,000,000 Gallons
Shape of Overflow or Spillway Irregular (see sketch) Outlets (Pipes or Flumes)
None with flashboards 7 ft. wide by 9 ft. deep
Constructed by _____ Date _____
Last Repairs _____ Date _____
Cause of Leakage None
Condition Good except spillway
Topography of Country Below Slightly irregular - Mowed land
Age, extent, proximity, etc. of buildings, roads or other property in danger if failure should occur
Failure unlikely - might cut down through wood land gradually and possibly undermine Tarrey St. retaining wall.
Remarks and Recommendations A proper dyke and spillway should be constructed
though apparently there is no immediate danger in the present arrangement or lack of it. Unchanged Sept. 1932. Unchanged Aug. 1940
No change Feb. 1942. No change May, 1944. No change Sept. 1946. No change
Mar. 1948. No changes Nov. 1950. No change - sound July 1952. Good Dec. 1954.
Sound - no changes. Sept. 1956. Sound - low water Oct. 1957. Sound - fair shape Sept. 1958
Sound - sound Oct. 1960. Sound - no changes Oct. 1962. Good - no change Oct. 1964. Good - no change
Oct. 1966. Good - no change Oct. 1968.

DAM NO 129.....



INSPECTION REPORT - DAMS AND RESERVOIRS (129)

CE
FILE 224

1. Location: City/Town BROCKTON Dam No. 7-12-44-1

Name of Dam BIGNEY POND Inspected by: A. DUGAN

Date of Inspection 12-5-1972

2. Owner/s: Per: Assessors X Prev. Inspection 12-8-70

Reg. of Deeds _____ Pers. Contact _____

1. YOUNG MEN'S HARREW ASSOCIATION
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

3. Caretaker: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

AL MINTZ EXECUTIVE DIRECTOR TELEVISION PARKWAY, BROCKTON
Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

4. No. of Pictures taken NONE

5. Degree of Hazard: (if dam should fail completely)*

1. Minor _____ 2. Moderate X

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual X

Operative _____ yes; _____ No

Comments: _____

7. Upstream Face of Dam: Condition:

Conditions:

1. Good X 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: A FEW TREES AT EDGE OF MASONRY

-2-

8. Downstream Face of Dam:

Condition: 1. Good

Dam No. 7-12-44-1

2. Minor Repairs Y

3. Major Repairs

4. Urgent Repairs

Comments: SCALE SPALLING CONCRETE

9. Emergency Spillway:

Condition: 1. Good ✓

2. Minor Repairs

3. Major Repairs

4. Urgent Repairs

Comments:

10. Water Level at Time of Inspection:

1.1 ft. above . below . top of dam

principal spillway . other .

11. Summary of Deficiencies Noted:

Growth (Trees & Brush) on Embankment FELL

Animal Burrows & Washouts N/C

Damage to Slopes or Top of Dam N/C

Cracked or Damaged Masonry A LITTLE

Evidence of Seepage N/C

Evidence of Piping N/C

Erosion N/C

Leaks N/C

Trash and/or Debris Impeding Flow N/C

Clogged or Blocked Spillway N/C

Other

12. Remarks & Recommendations: (Fully Explain)

TORREY STREET

13. Overall Condition:

1. Safe X
2. Minor Repairs Needed _____
3. Conditionally Safe - Major Repairs Needed _____
4. Unsafe _____
5. Reservoir Impoundment no Longer Exists (explain)
Recommend Removal from Inspection List _____

APPENDIX D
OUTLINE OF DRAINAGE AREA AND
HYDRAULIC COMPUTATIONS

Page No.

LINE OF DRAINAGE AREA

Drainage Area Map

D-1

COMPUTATIONS

Size and Hazard Classification

D-2

Water Surface Area vs. Elevation Graph

D-3

Calculation of the 100-year and 50-year

D-4

Frequency Storms

Outlet Rating Curve Calculations

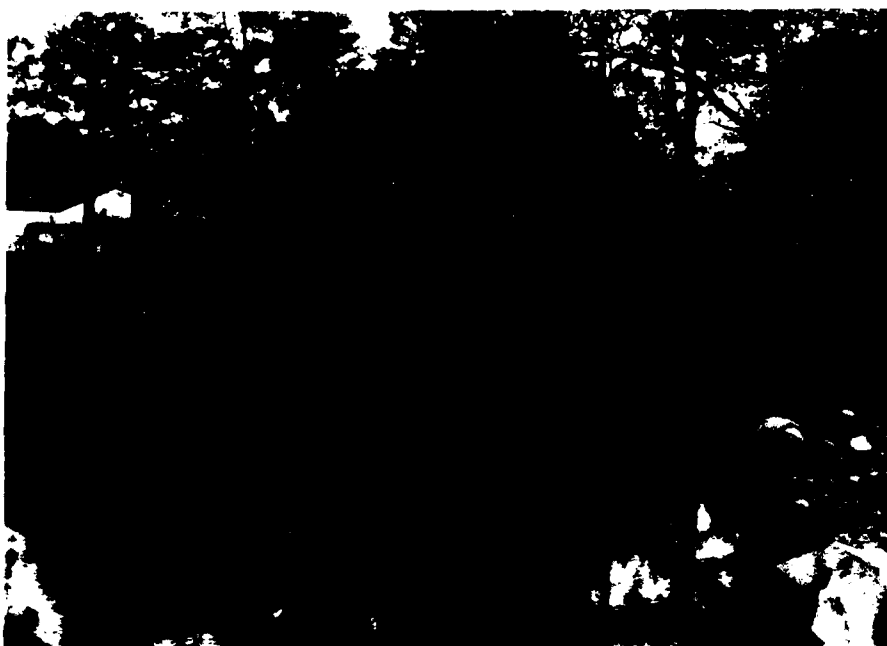
D-10

Dam Failure Analysis

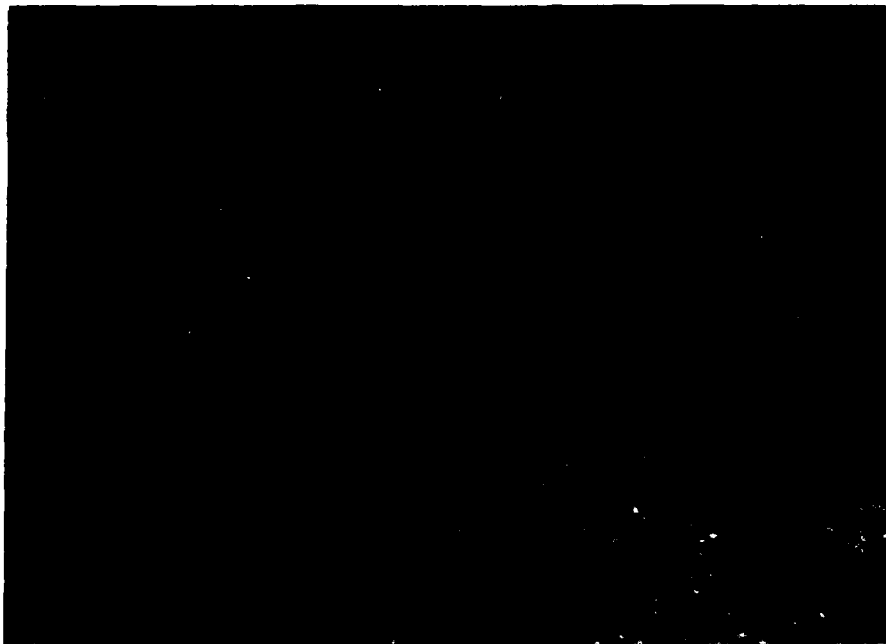
D-16



10. Bigney Pond upstream of dam



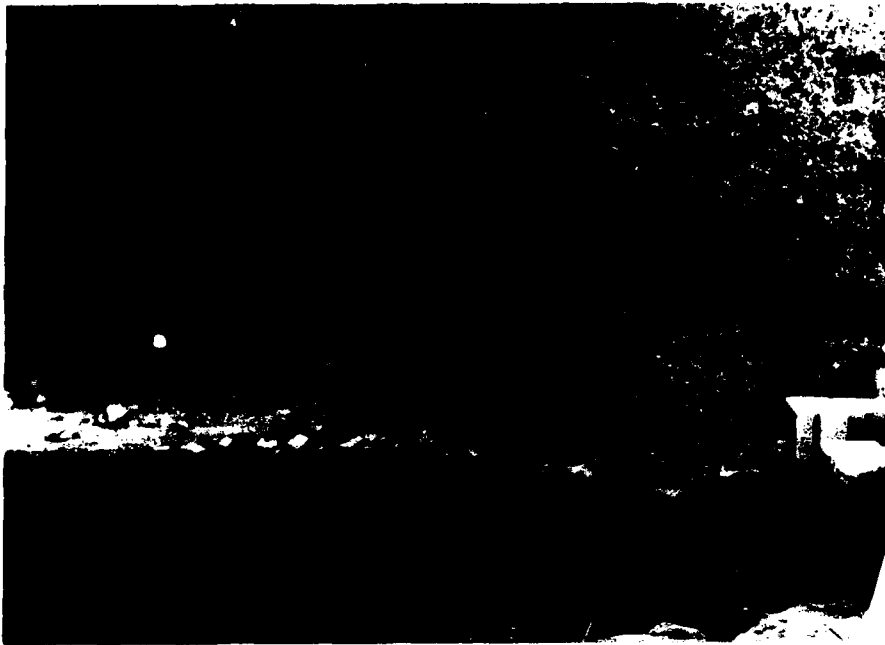
11. Pond and old dam downstream of Torrey Street



8. Approach channel to overflow culvert



9. Overflow culvert structure



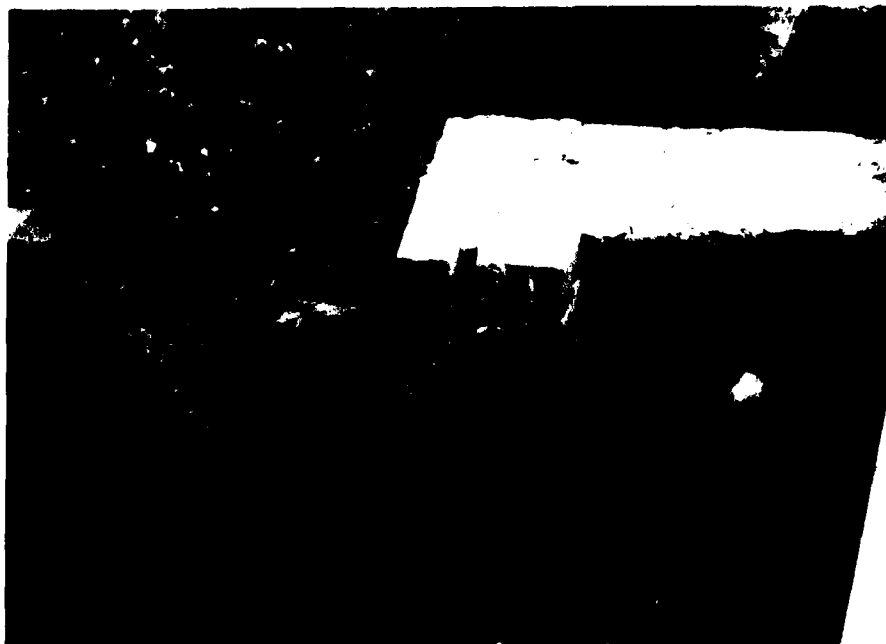
6. Earthen dike where overflow from pond would enter woods



7. View down axis of dam



4. Spillway structure



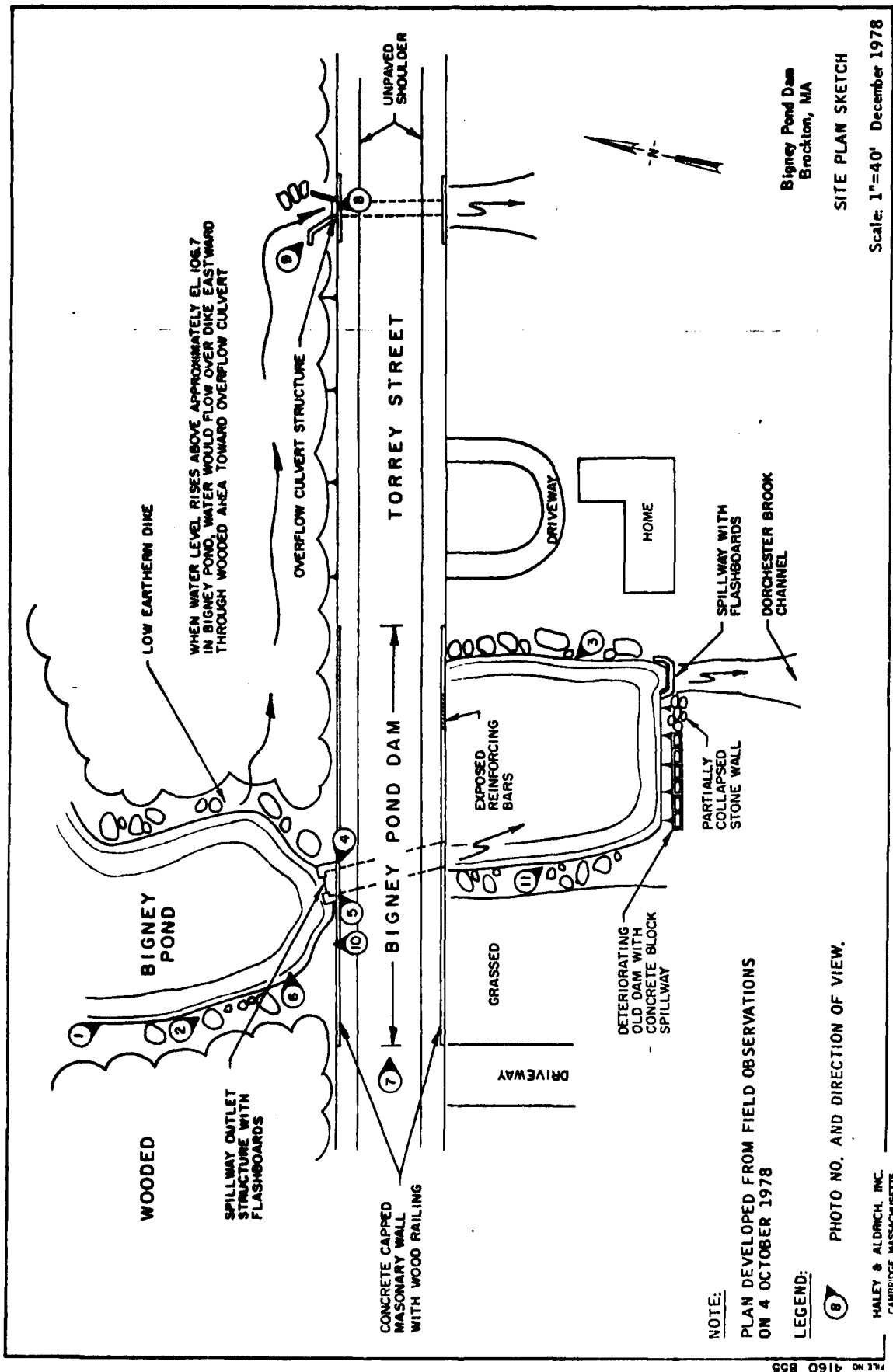
5. Slot for flashboards in spillway outlet structure

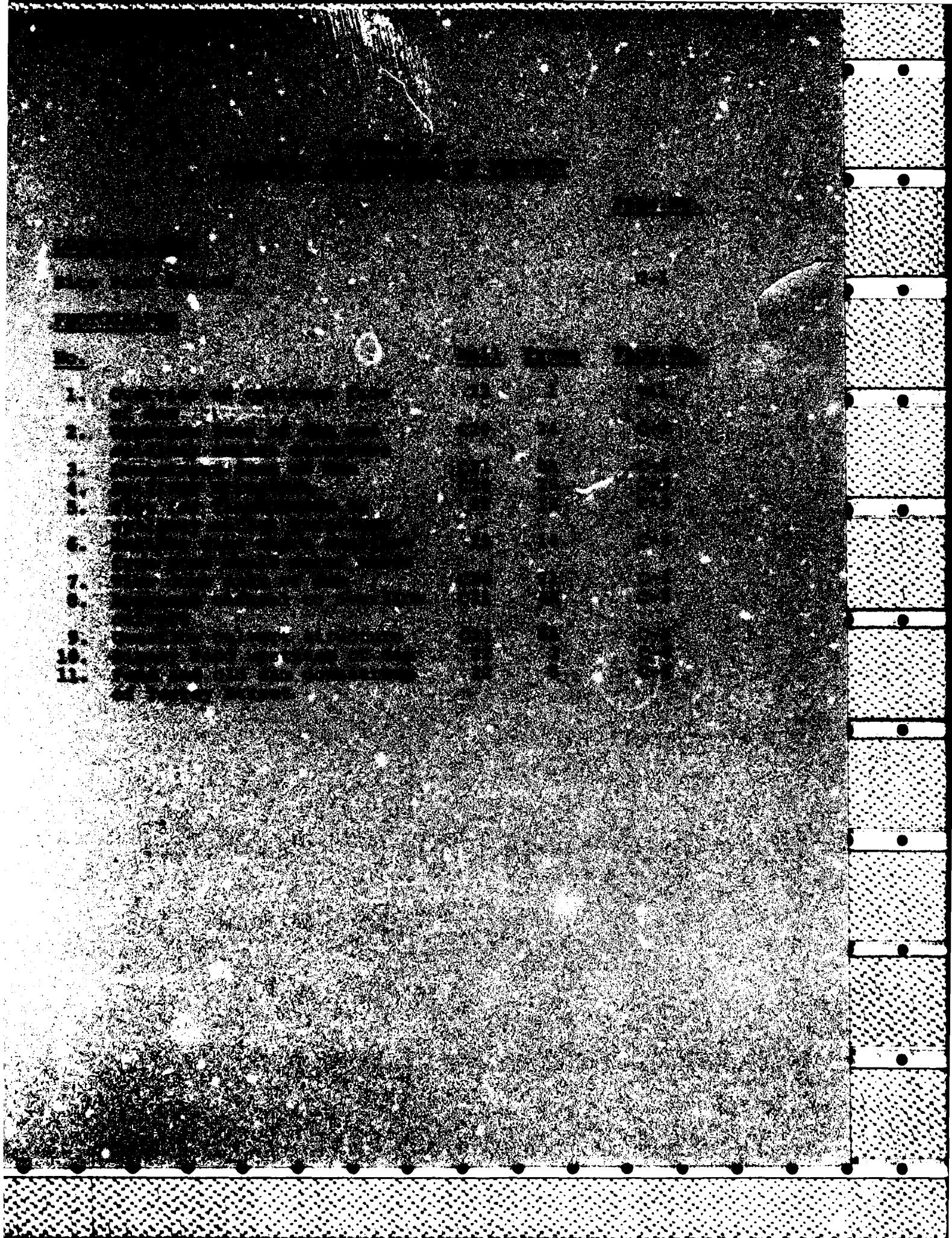


2. Upstream face of dam and spillway outlet structure



3. Downstream face of dam





DAM NO. 7-12-44-1

9. A. Description of Present Land Usage Downstream of Dam:

60 % rural 40 % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure yes no

10. Risk to Life and Property in Event of Complete Failure

No. of People 0

No. of Homes 25 (houses only)

No. of Businesses 0

No. of Industries 0

Type

No. of Utilities 4

Type Gas, Water, Tel & Elect.

Railroads 0

Other Dams * yes

Other Pearl St.

11.

Attach sketch of dam to this form showing section and plan on an 8 1/2" x 11" sheet.

* There is a small ponding area approx. 125,000 gals. on the south side of Torrey St with an old stone faced dam including conc. flume & overflow spillway. This small dam is all undermined and in very poor condition with much debris in Dorchester Brook. Said dam is owned by:
Mr. Howard E. Briggs, Jr.
673 Torrey St
Brookton, Mass. 02400.

DESCRIPTION OF DAM

DISTRICT 7

Submitted by K. B. Harrison Dam No. 7-12-44-1

Date 7-31-75 City/Town Brockton

Name of Dam Bigney Pond

1. Location: Topo Sheet No. 32 D

Provide 8 1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year Built Unknown Year/s of Subsequent Repairs Unknown

3. Purpose of Dam: Water Supply _____ Recreational ☒
Irrigation _____ Other _____

4. Drainage Area: 5 Sq. Mi. _____ Acres

5. Normal Ponding Area: _____ Acres _____ Ave. Depth
Impoundment: 8,000,000 Gals. _____ Acre Ft.

6. No. and Type of Dwellings Located Adjacent to Pond or Reservoir
i.e. Summer Homes, etc. 1 Recreational Camp - 3 Houses

7. Dimensions of Dam: Length 175' ± Max. Height 11' ±
Slopes: Upstream Face Vertical
Downstream Face Vertical
Width Across Top 48'

8. Classification of Dam by Material:
Earth ☒ Conc. Masonry ☒ Stone Mason. ☒
Timber _____ Rockfill _____ Other Terrace St.

12. Remarks & Recommendations (fully explain)

*Terry St itself makes up this dam
Large conc flume w/ flashboard in good
condition - Stone masonry retaining walls
on both sides at Terry St in good condition
One section of concrete cap on south side needs
patching, as reinforcing rods exposed.*

13. Overall Conditions

1. Safe ☒
2. Minor Repairs Needed ☐
3. Conditionally Safe - Major Repairs Needed ☐
4. Unsafe ☐
5. Reservoir Impoundment no Longer Exists (explain)
Recommend Removal from Inspection List ☐

8. Downstream Face of Dam:

Condition: 1. Good ☒ 2. Minor Repairs ☒
3. Major Repairs _____ 4. Urgent Repairs _____

Comments: Minor deterioration of concrete at
one location on retaining wall - needs
patching

9. Emergency Spillway:

Condition: 1. Good ☒ 2. Minor Repairs _____
3. Major Repairs _____ 4. Urgent Repairs _____

Comments: Very little water flowing through same -
no flashboards - stream almost dried up.

10. Water Level at Time of Inspection:

2.4 ft. _____ above. ☒ below. _____ top of dam.
☒ principal spillway. _____ other.

11. Summary of Deficiencies Noted:

Growth (Trees & Brush) on Embankment No
Animal Burrows & Washouts No
Damage to Slopes or Top of Dam No
Cracked or Damaged Masonry Yes - Minor
Evidence of Seepage No
Evidence of Piping No
Erosion No
Leaks No
Trash and/or Debris Impeding Flow No
Clogged or Blocked Spillway No
Other _____

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town Brockton Dam No. 7-12-44-1
 Name of Dam Biggley Pond Inspected by: K. B. Harrison & G. G. Ruggieri
 Date of Inspection: 6-25-75

2. Owner/s: Per: Assessors ✓ Prev. Inspection 12-5-72

Reg. of Deeds _____ Pers. Contact _____

Dam
Owner

1. City of Brockton, City Hall, Brockton, Mass 02401
 Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

Water
Rights

Young Men Hebrew Ass'n, 70 Mt. Erie Dr., Brockton
 Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

71 Legia Parkway Brockton, Mass.
 Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

3. Caretaker: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name _____ St. & No. _____ City/Town _____ State _____ Tel. No. _____

4. No. of Pictures taken: One (1)

5. Degree of Hazard: (if dam should fail completely)*

1. Minor ✓ 2. Moderate _____

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual ✓

Operative ✓ Yes _____ No _____

Comments: Cause Flow w/ flashboards & large stone
subject under Theory of

7. Upstream Face of Dam: Condition:

Conditions:

1. Good ✓ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

August 21, 1975

Honorable David E. Crosby
Mayor of Brockton
City Hall
Brockton, Massachusetts 02401

RE: Inspection - Dam #7-12-44-1
Brockton
Signey Pond Dam

Dear Mayor Crosby:

On June 25, 1975, an engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate that this dam is owned by the City of Brockton and that the Young Men's Hebrew Association has the water rights. Will you please notify this office if this information is not current.


The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970 (Dams-Safety Act).

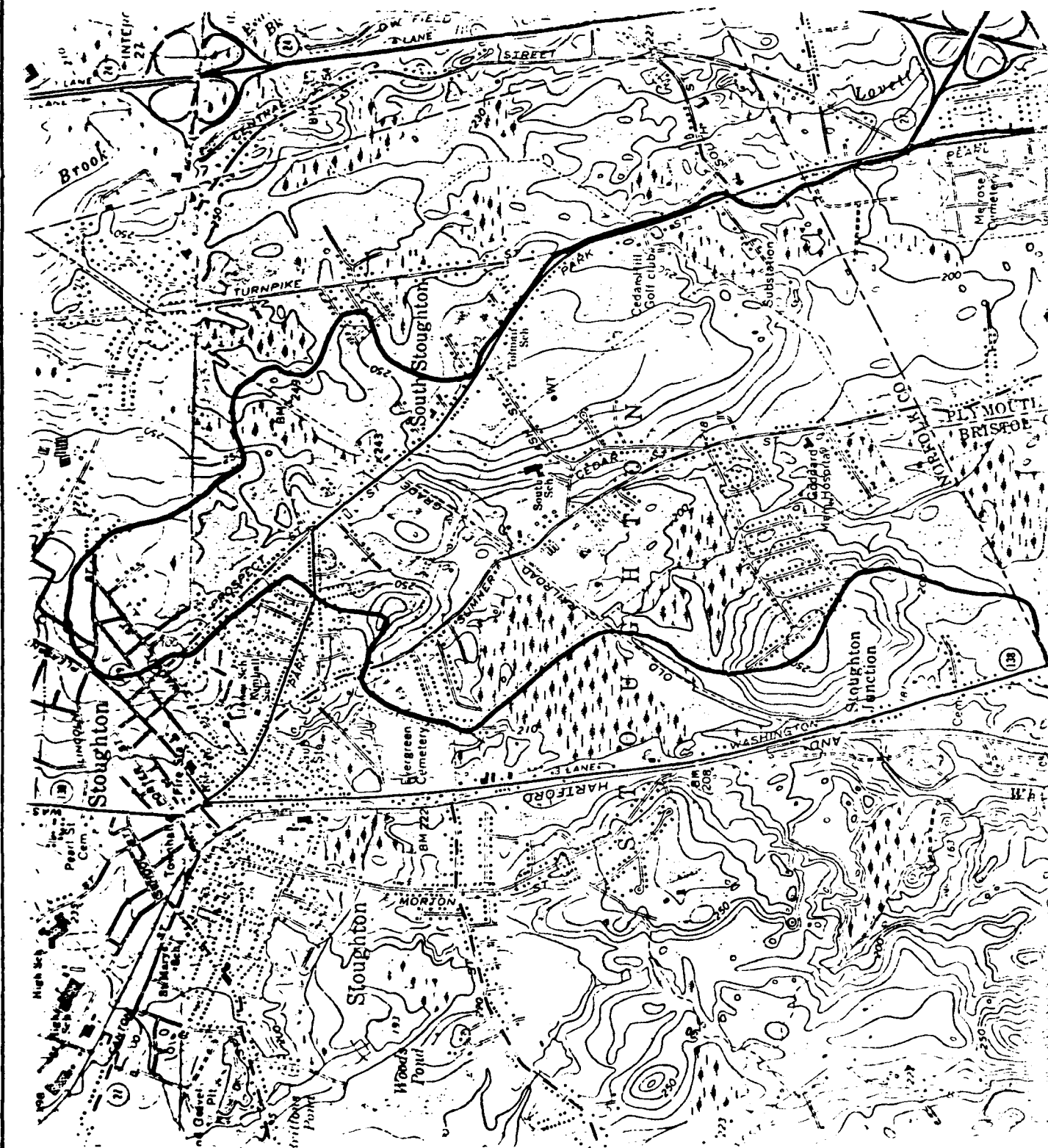
The results of the inspection indicate that this dam is safe; however, a section of the concrete cap of the retaining wall on the southerly side of Torrey Street needs to be patched as the reinforcing rods are exposed.

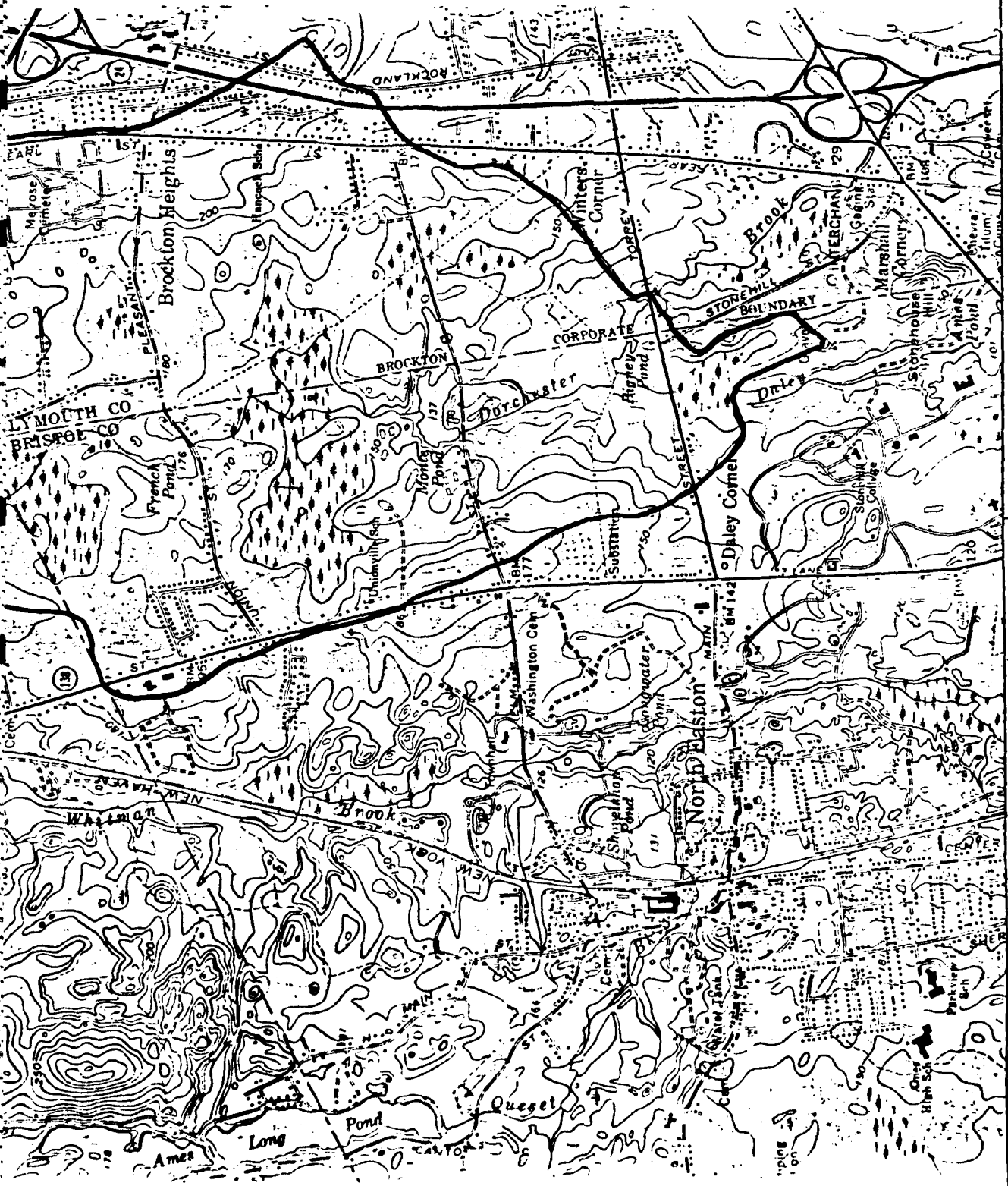
We call this condition to your attention now, before it becomes serious or more expensive to correct.

Very truly yours,

ROBERT T. TILBNEY, P.E.
Chief Engineer

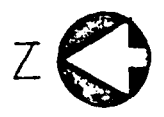

cc: Young Men's Hebrew Association
Robert A. Fulmer, City Eng.
R.J. Hollister
A. E. Harrison





BIGNEY POND DRAINAGE AREA

Scale: 1:24,000



CAMP DRESSER & MCKIE INC.
Consulting Engineers
Boston, Mass.

Size and Hazard Classification

Size Classification

Elev. Top of Dam : 110'
Elev. Spillway Crest : 98.7'

Height of Dam - 11.30' $< 25'$

Storage (at elev. 110) = $\frac{1}{3} \times 3.2^2 \times 11.30 = 12.1 \text{ Aca-A}$
 $< 50 \text{ A-A}$

Hazard Classification

Because of lack of downstream development,
initially assume dam to be of low hazard.

\therefore Size : small
Hazard : low

Period of Record

U.S.G.S. Gage located approximately 4600 feet downstream
of Terrey Street. Drainage Area of gage = 4.67 sq. mi.

Flood of Record : March 18, 1968
Qpeak = 359 cfs

Period of Record : Gage has been in since Oct. 1968

Drainage Area

Area to Quincy Pond = 4.62 sq. mi.

Test Flood

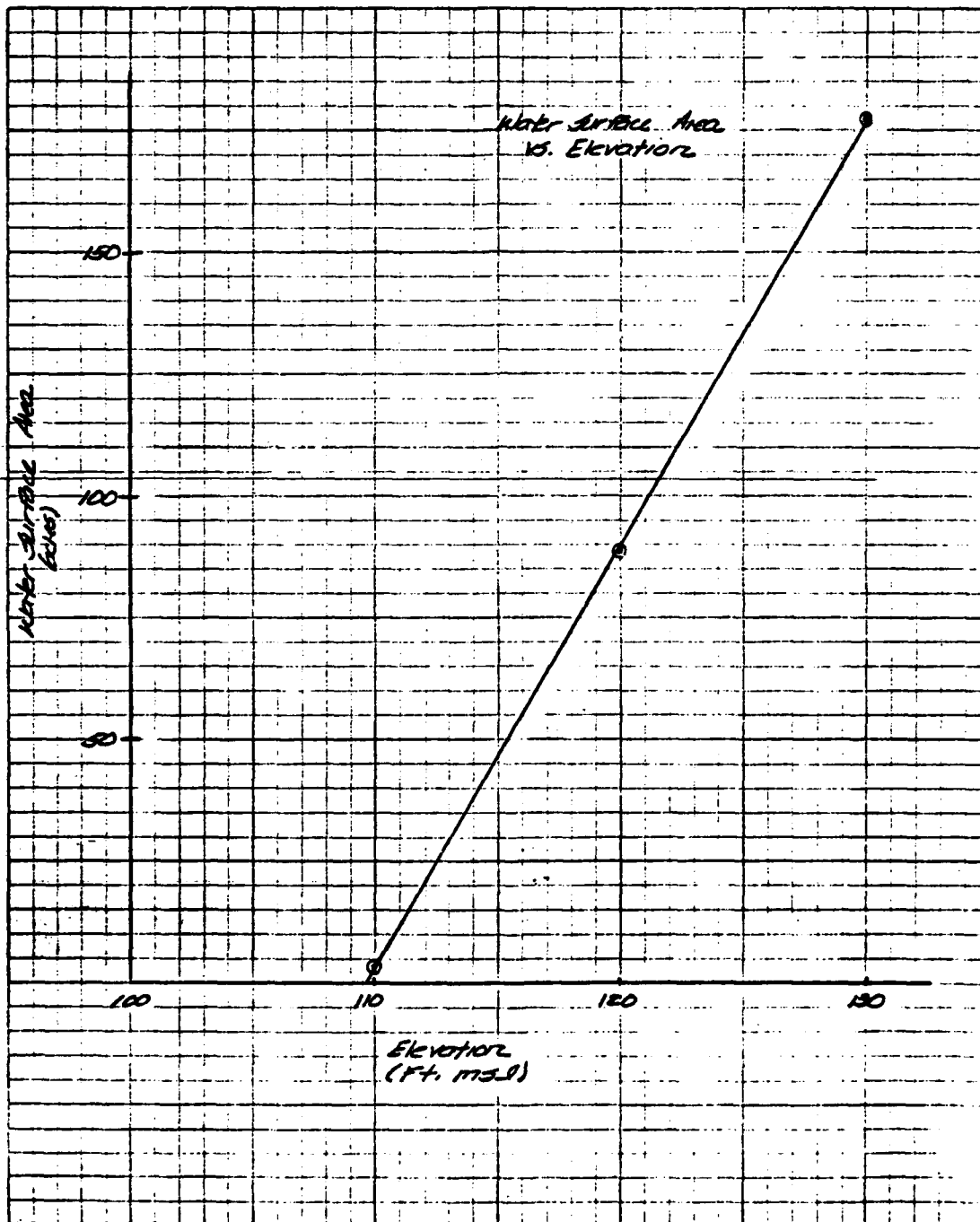
Range 50 \rightarrow 100 Year Frequency Flood

CAMP DRESSER & MOORE
Environmental Engineers
Boston, Mass.

CLIENT Holy and Aldrich
PROJECT Latent Area Map
DETAIL Survey Plot

JOB NO. 5101-A-RT
DATE CHECKED 11/28/78
CHECKED BY DBK

PAGE 3 of 16
DATE 10/23/78
COMPUTED BY dlb



CAMP DRESSER & MOORE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT National Arm Inspr
DETAIL Bogus Pond

JOB NO. STL-B-PT
DATE CHECKED 12-2-79
CHECKED BY CEH

PAGE 2 of 16
DATE 10/24/79
COMPUTED BY dlb

Calculation of the Test Flood

Times of Travel, T_e , Lag

Overland Flow: 2850 feet

$$\text{slope} = \frac{300-255}{2850} = .016$$

$$\text{velocity} = 0.64 \frac{1}{s} ; T_f = 1.24 \text{ hours}$$

Channel Flow: 25,150 feet

$$\text{slope} = \frac{255-100}{25,150} = .0062$$

$$\text{velocity} = 1.18 \frac{1}{s} ; T_f = 5.92 \text{ hours}$$

Time of Concentration = 7.16 hours

Lag Time = 4.30 hours

$\Delta D = 0.46 = 1.72 \text{ hours}$

$T_{DD} = 12.04 \text{ hours}$

Curve Number Analysis - Hydrologic Group D

<u>Land use</u>	<u>Area</u>	<u>CN</u>	<u>CN x Area</u>
Marshland	525 ^A	98	51450
Road Surfaces	30 ^A	100	3000
Residential	140 ^A	87	12180
Roads	50 ^A	98	4900
Open Spaces	2210	80	176800
	<u>2955</u>		<u>249330</u>

$$\text{Wtd CN} = \frac{84}{84}$$

$$\therefore S = \frac{1000 - 10}{84} = 11.905$$

Precipitation

50 yr. - 12 hr. rainfall : 5.1 inches

100 yr. - 12 hr. rainfall : 5.9 inches

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Boston, Mass.

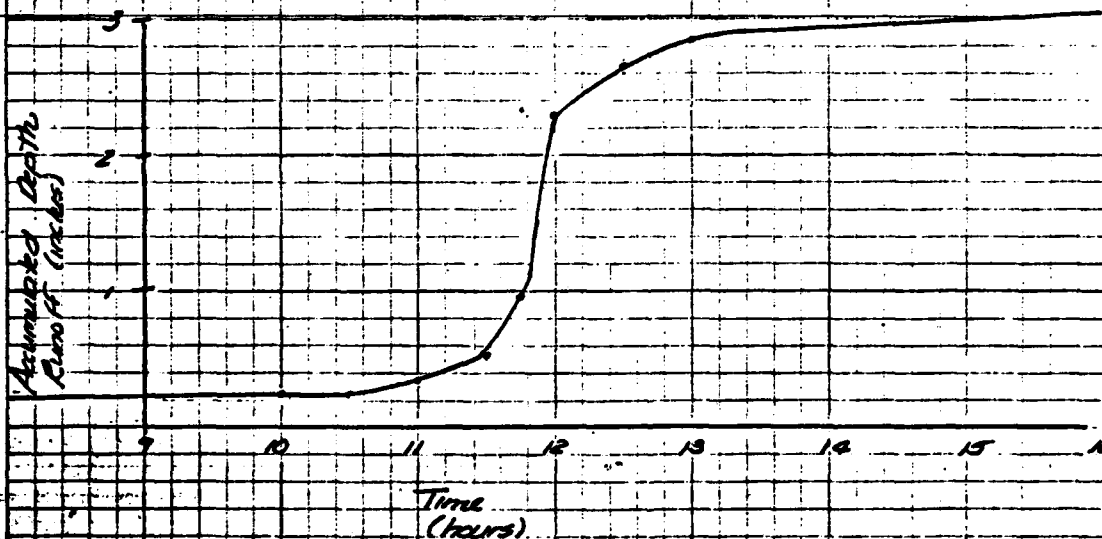
CLIENT Hobbs and Aldrich
PROJECT Leitchfield Dam, 1980
DETAIL Boggy Road

JOB NO. 561-S-PT
DATE CHECKED 4-22-78
CHECKED BY Miller

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Investigation of 100 year Flood

Time (hours)	P_2/P_1	Mass P (inches)	Mass Q (inches)
10.0	.181	1.07	.244
10.5	.204	1.20	.266
11.0	.235	1.39	.350
11.5	.283	1.67	.520
11.75	.307	2.28	.948
12.0	.663	3.91	2.292
12.5	.735	4.34	2.673
13.0	.772	4.55	2.862



$$11.88 - 4.5 (1.72) = 4.14$$

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Environmental Engineers
Boston, Mass.

CLIENT Hokuriku Alkali
PROJECT National Park Insp
DETAIL Eligible Road

JOB NO. SL-1-B-PT
DATE CHECKED 11-22-78
CHECKED BY CS/ML

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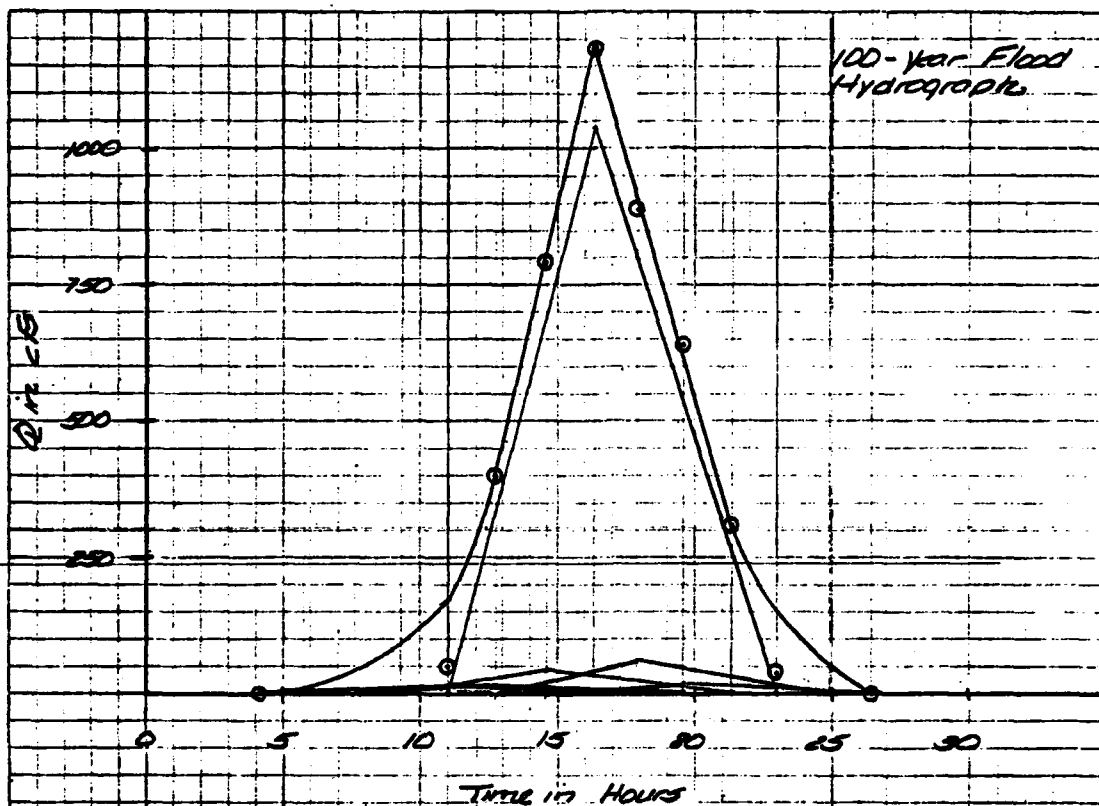
Computations For Instantaneous Peak Discharge						
Increment	Time (hours)	Loss (inches)	ΔQ (inches)	Δq (cfs)	Y	$Y \Delta q$ (cfs)
ΔQ_1	4.14	0.10	.04	17	0.2	3
ΔQ_2	5.86	0.14	.05	22	0.4	9
ΔQ_3	7.58	0.19	.04	17	0.6	10
ΔQ_4	9.30	0.23	.12	52	0.8	42
ΔQ_5	11.02	0.35	2.40	1039	1.0	1039
ΔQ_6	12.74	2.75	.20	87	0.667	58
ΔQ_7	14.46	2.95	.11	48	0.333	16
	16.18	3.00				$\Sigma 1177$ cfs
$\Delta q = \frac{484 \times 4.62 \text{ sq. mi.}}{1.22 + 4.30} \Delta Q = 433 \Delta Q$						

CAMP DRESSER & MAKEE
Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT Naticum Dam Imp.
DETAIL Spillway Pond

JOB NO. 561-B-PT
DATE CHECKED 10-22-79
CHECKED BY W. Miller

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COMPUTED BY dlh



Investigation of 50-Year Flood

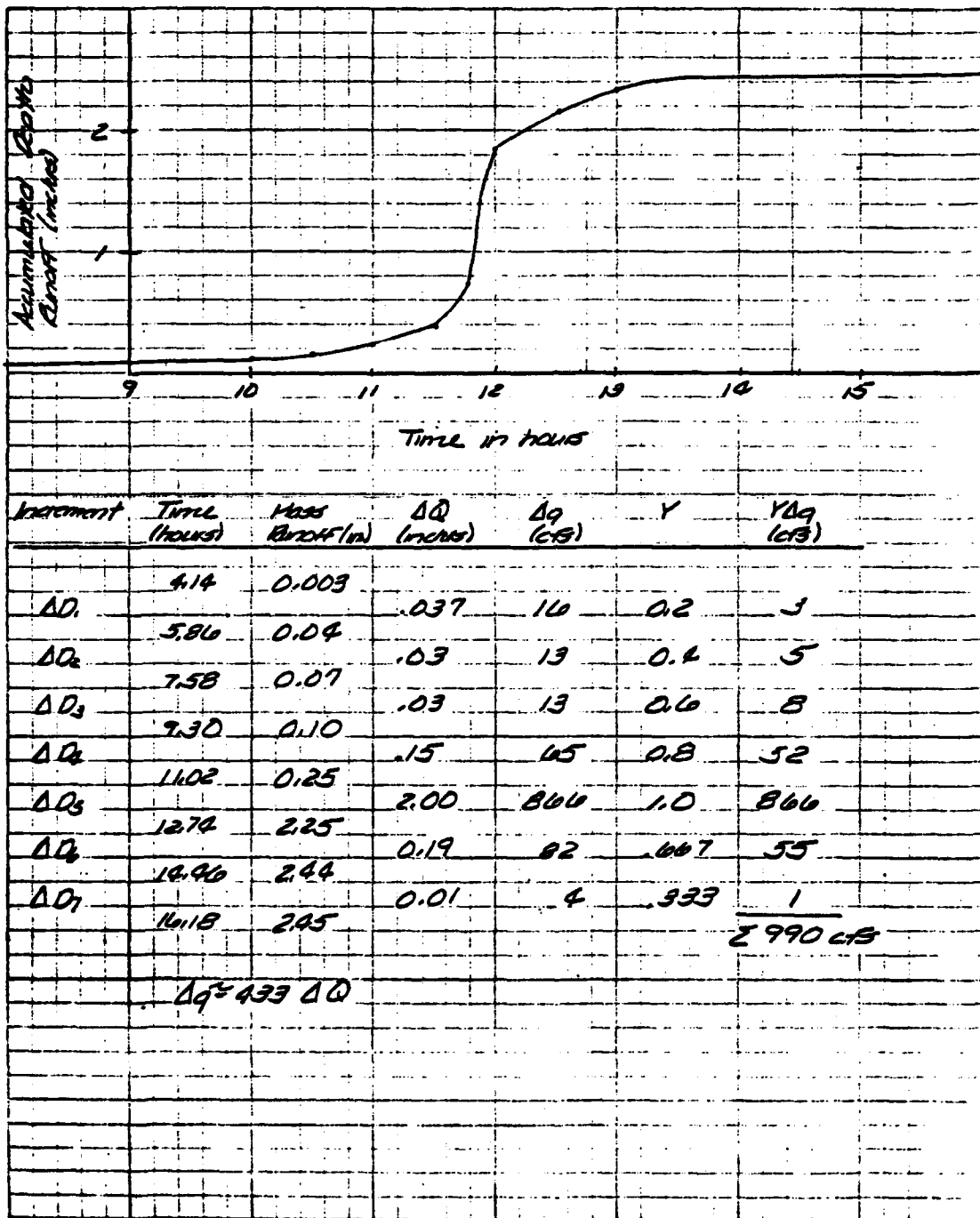
Time (hours)	R ₁ /R ₂	Mass P (inches)	Mass Q (inches)
10.0	.181	1.923	.120
10.5	.204	1.040	.170
11.0	.235	1.200	.240
11.5	.283	1.643	.380
11.75	.387	1.974	.725
12.0	.463	3.381	1.835
12.5	.735	3.789	2.151
13.0	.772	3.937	2.316

CAMP DRESSER & MAKER
Environmental Engineers
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CLIENT Haley and Aldrich
PROJECT National Park Insp.
DETAIL Biogrey Pond

JOB NO. 561-A-ET
DATE CHECKED 12/2/82
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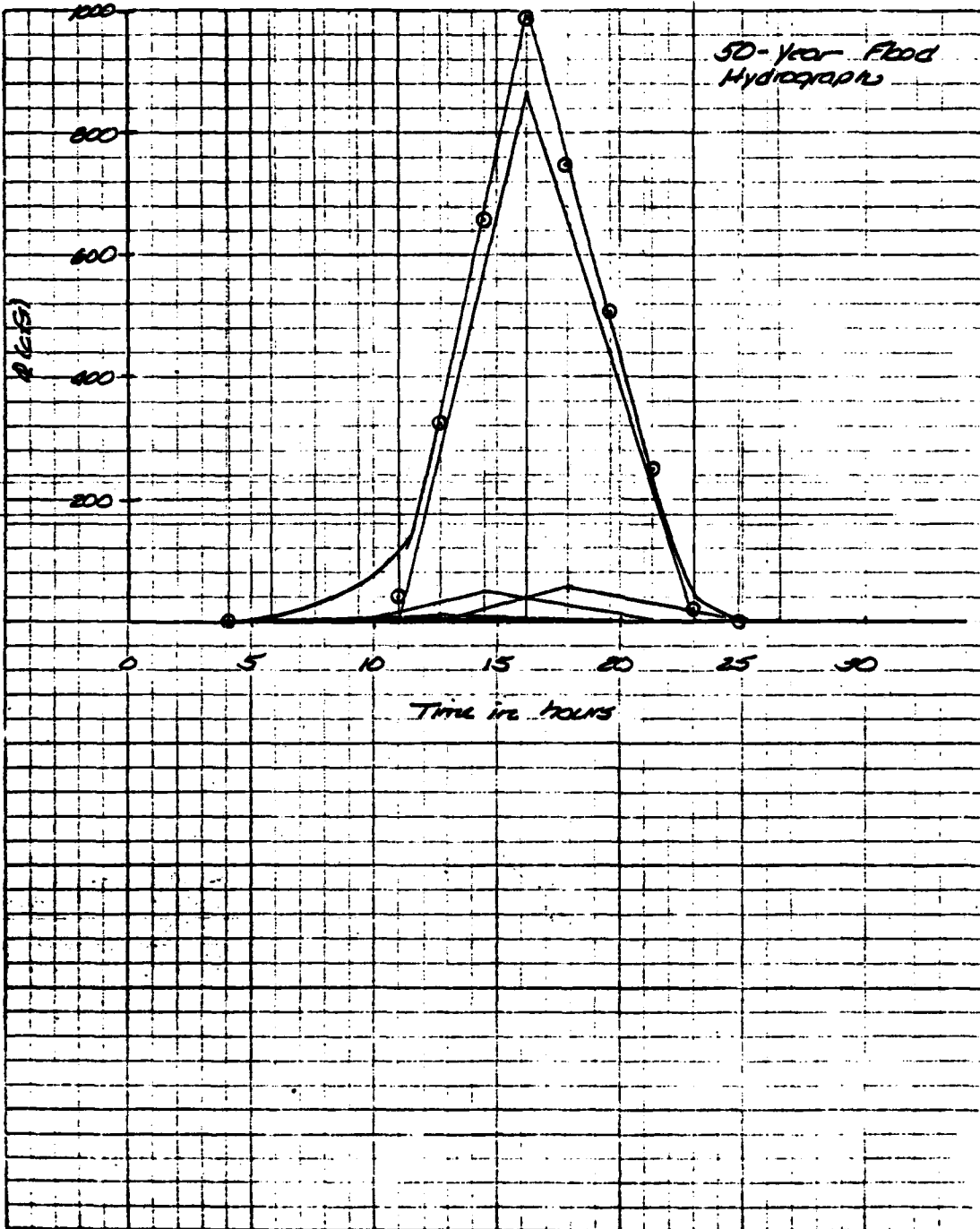


CAMP DRESSER & MOORE
Environmental Engineers
Boston, Mass.

CLIENT Hill and Aldrich
PROJECT National Dam 1050
DETAIL Design, Pond

JOB NO. 541-B-PT
DATE CHECKED 12/2/79
CHECKED BY CEH

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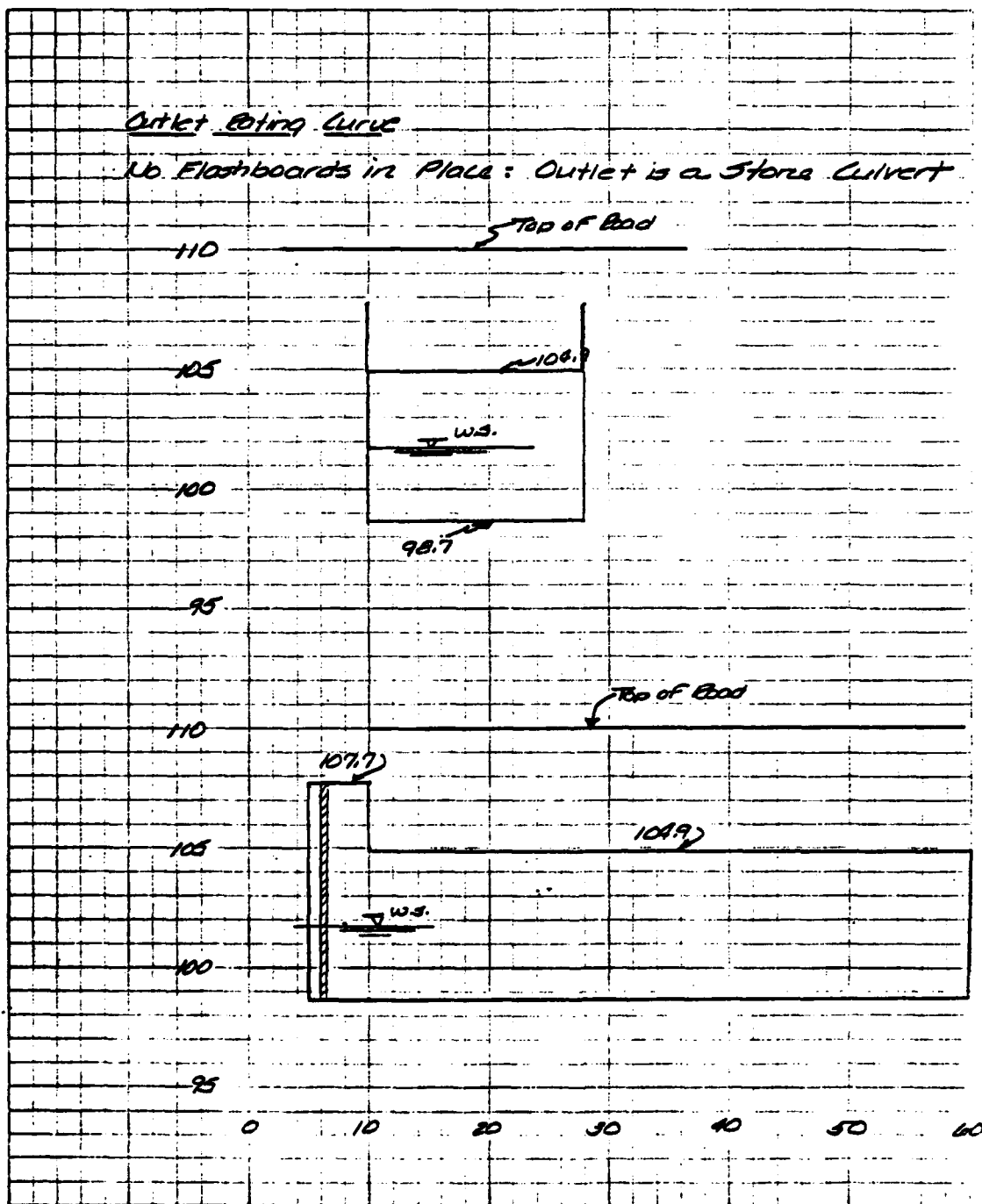


CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Whaley and Aldrich
PROJECT Lottery Lane Bridge
DETAIL Bridge Road

JOB NO. 561-A-RT
DATE CHECKED 11-22-75
CHECKED BY Miller

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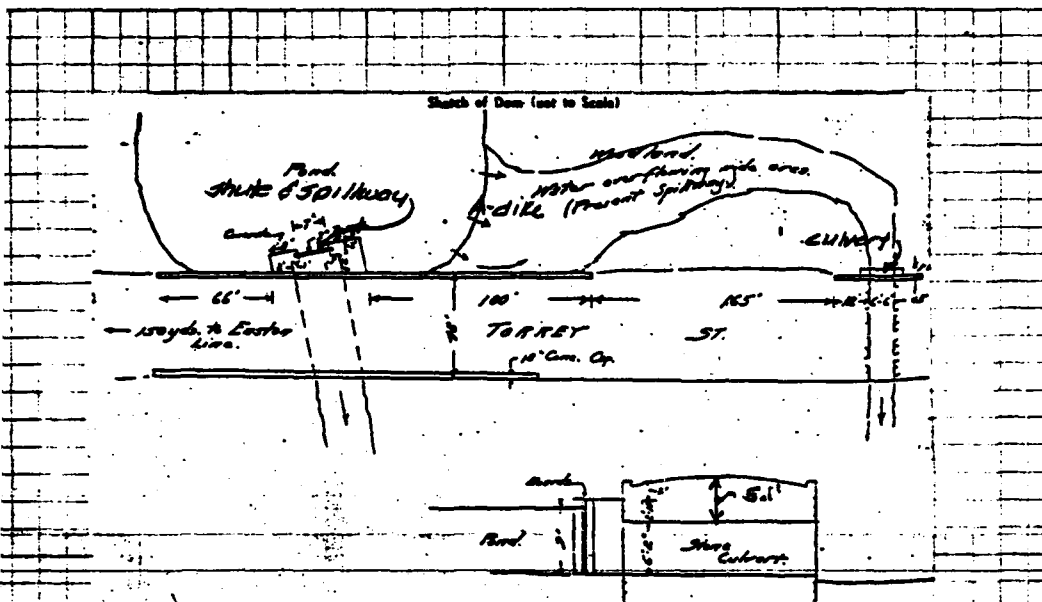


NEBBER & McKEE
 Civil Engineers
 Boston, Mass.

CLIENT Harley and Alkitch
 PROJECT Waterpool Dam No. 130
 DETAIL Spillway Basin

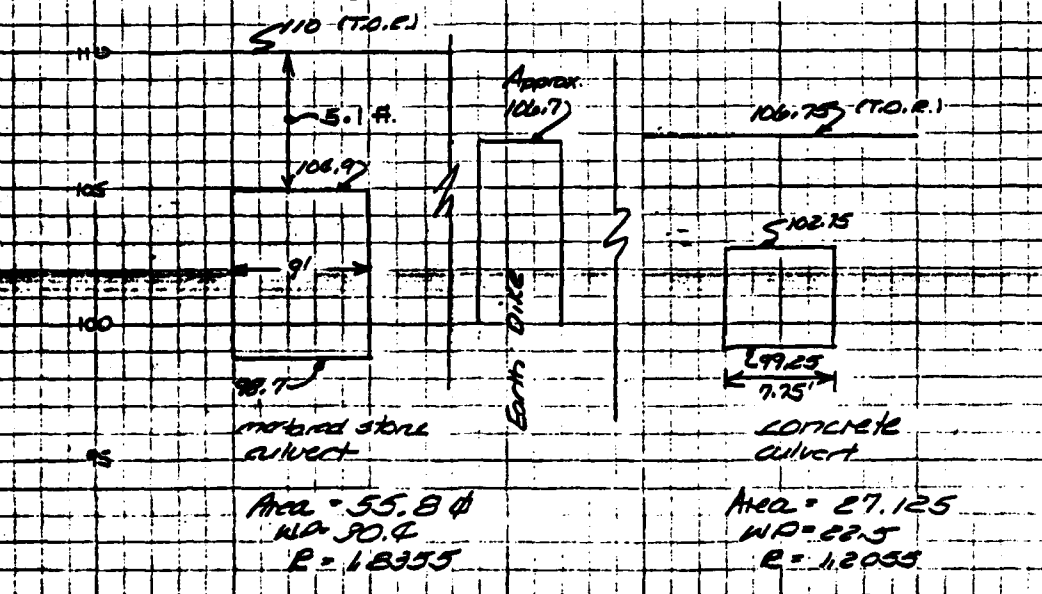
JOB NO. 5161-B-PT
 DATE CHECKED 12-2-79
 CHECKED BY CF Miller

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Elevation of Dike A = 106.7 ft. (M.S.L.) (very irregular)

Relative Elevations of Two Outlet Structures



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Environmental Engineers
Boston, Mass.

CLIENT Haley and Aldrich
PROJECT National Ave. 1750
DETAIL Biquity Road

JOB NO. 511-P-RT
DATE CHECKED 1-22-79
CHECKED BY CPH

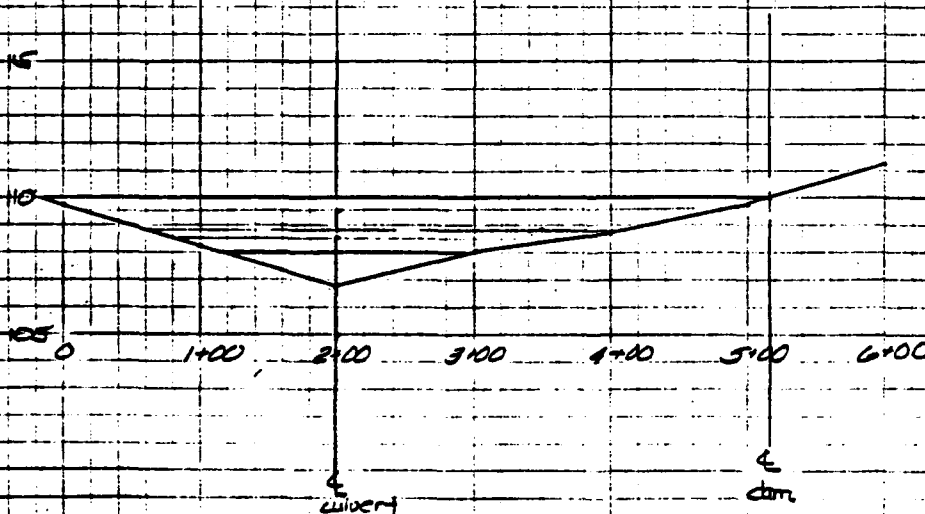
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DATE 11/25/78
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During normal conditions, ponding on both sides of
Biquity Street.

Assume ponding will reach elevation 104.9 on the
downstream side, at height of storm.

Elev. of Water Surf. (upstream)	$N = 0.75$ Q_{storm} (c.f.s.)	$K = 2.5$ max. length Dike = 200' Q_{dike} (c.f.s.)	$K = 1.79$ Q_{culvert} (c.f.s.)	Q_{Total} (c.f.s.)
104.9	0	0	0	0
106	352	0	0	352
106.7	451	0	0	451
108	591	741	At w.s.e. = 106.75 pressure flow = 3000 cfs	
109	680	1744		
110	758	3000		

Road Profile - (looking downstream)



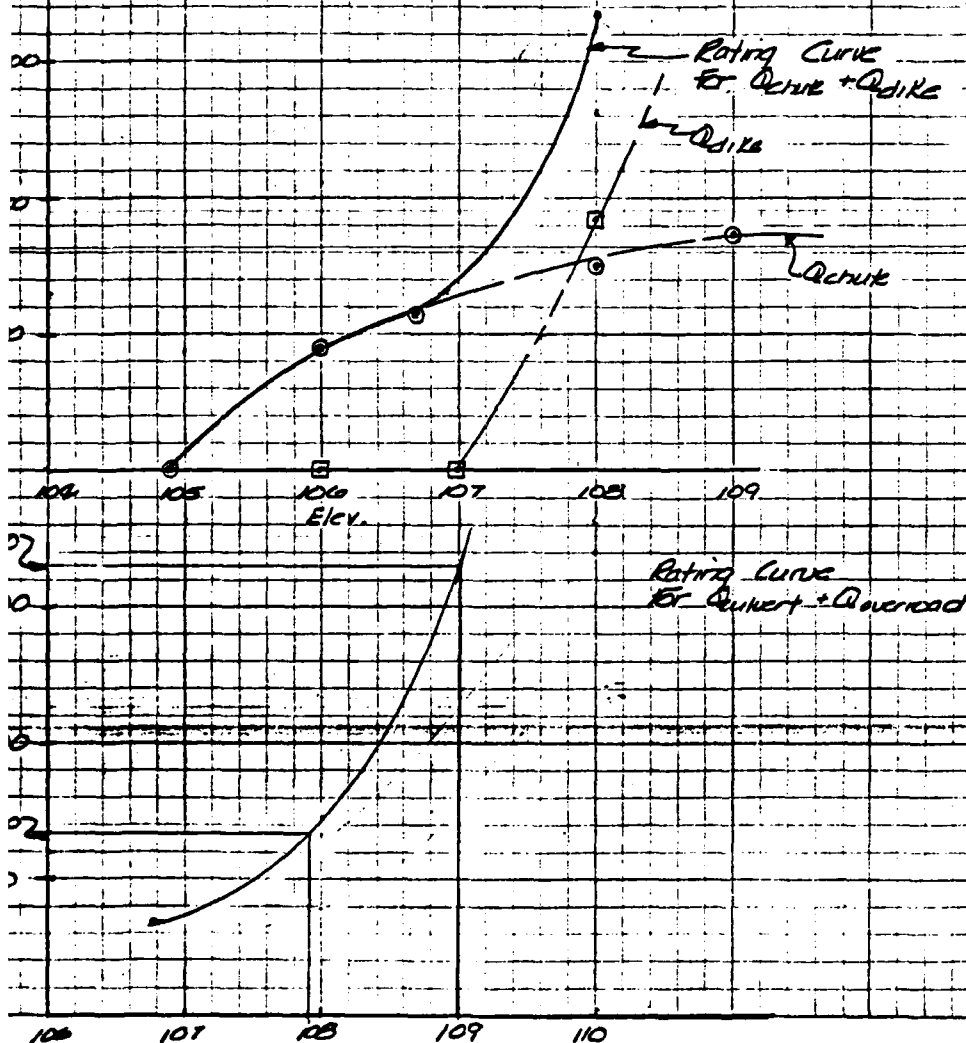
S. McKee
engineers
inc.

CLIENT Walt and Aldrich
PROJECT Internal Analysis
DETAIL Boggy Pond

JOB NO. SLD-B-ET
DATE CHECKED 11-2-8
CHECKED BY CEH

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Elev. Water at Dike	Q _{culvert}	Q _{avg} 1000	Q total
106.75	394	0	394
108.00	394	323	717
110.00	463	3881	4344



At water surface elevation = 107.85, the flow through the chute is 580 cfs, and the flow over the dike is approximately 600 cfs.

Elevation of water at culvert = 107.90. Therefore the road is overtopped for a length of 185 feet.

Note that the road at dam is not overtopped.

Analysis with Flashboards in place

From field inspection, it appears that there are provisions for 9.0 feet of Flashboards. However, only 8 ft. would be placed so as to prevent increased flooding of terrain. With all flashboards in place, spillway crest elevation = 106.7 which is the approximate elevation of the dike.

<u>Elev. of</u> <u>Water in</u> <u>Road</u>	<u>Q weir</u> <u>(sharp-</u> <u>crested)</u>	<u>Q dike</u> <u>(c.f.s.)</u>	<u>Q total</u> <u>(c.f.s.)</u>
106.7	0	0	0
108	35 ^{3.83}	741	776
109	83 ^{9.18}	1744	1827

$0.8' \times 7' = 5.6'$

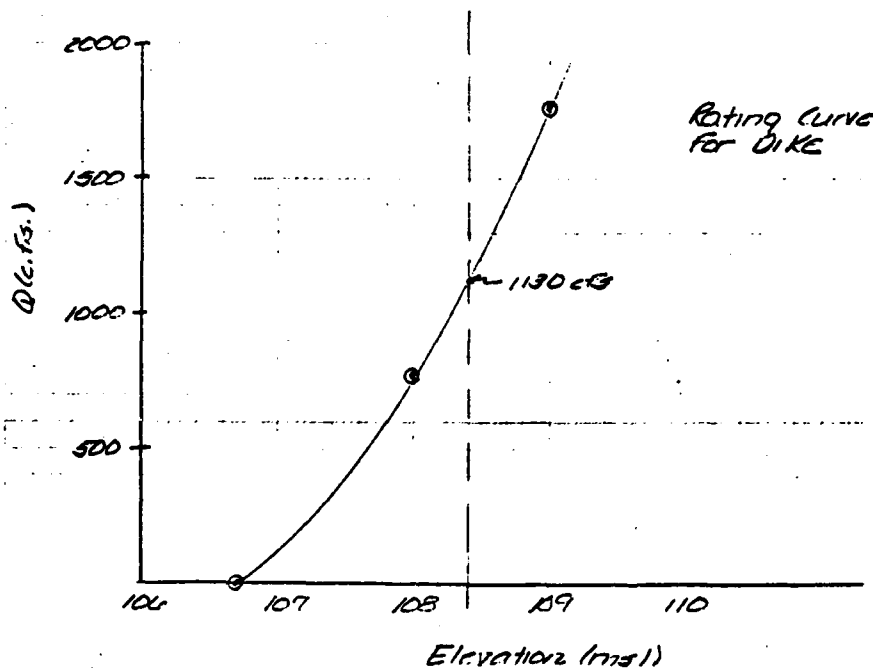
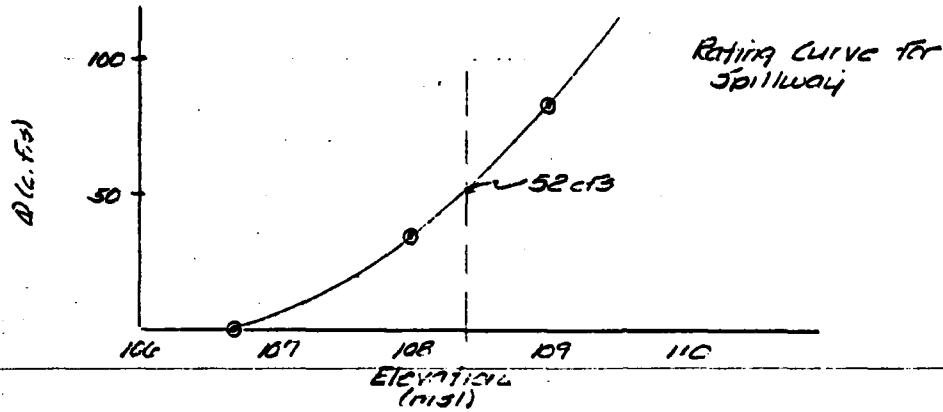
CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Holyoak Athletic
PROJECT National Ave. 1722
DETAIL Spillway Pond

JOB NO. 561-P-PT
DATE CHECKED 1/27/75
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At water surface elevation in Spillway Pond = 109 (m.s.l.),
the total outflow = 1827 c.f.s.



So, at water surface elevation is Biquay Pond = 109.4 ft.

$$Q_{\text{spillway}} = 52 \text{ cfs}, Q_{\text{dike}} = 1130 \text{ cfs}$$

if Q towards culvert = 1130 c.f.s.

then elev. of water over road is 109.0'

So, road is topped for an approximate length of 870 feet.

Dam Failure Analysis

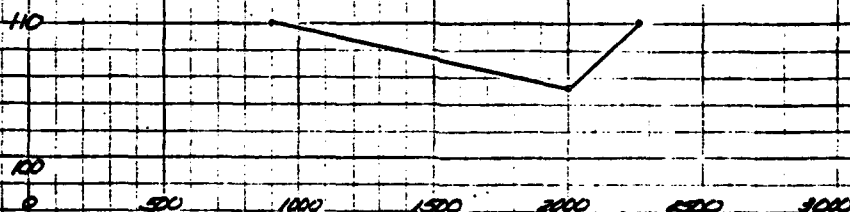
$$Dp_1 = 927 \text{ Wb } \sqrt{9} \text{ Y}_0^{3/2}$$

$$Y_0 = (11.30' + 7.25')/2 = 9.28'$$

$$W_b = \text{approximately } 180 \text{ feet} \times 0.50 = 90 \text{ feet}$$

$$Q_{p1} = 927 \times 90 \text{ ft.} \times \sqrt{9.2} \times (9.28')^{3/2} = 4280 \text{ cfs}$$

Reach 1 - looked 1400' downstream of dam
Cross Section



$$Q_{110} = 6886 \text{ cfs } (0.00328)^{3/2} A$$

$$A = 6413 \text{ sq. ft.}$$

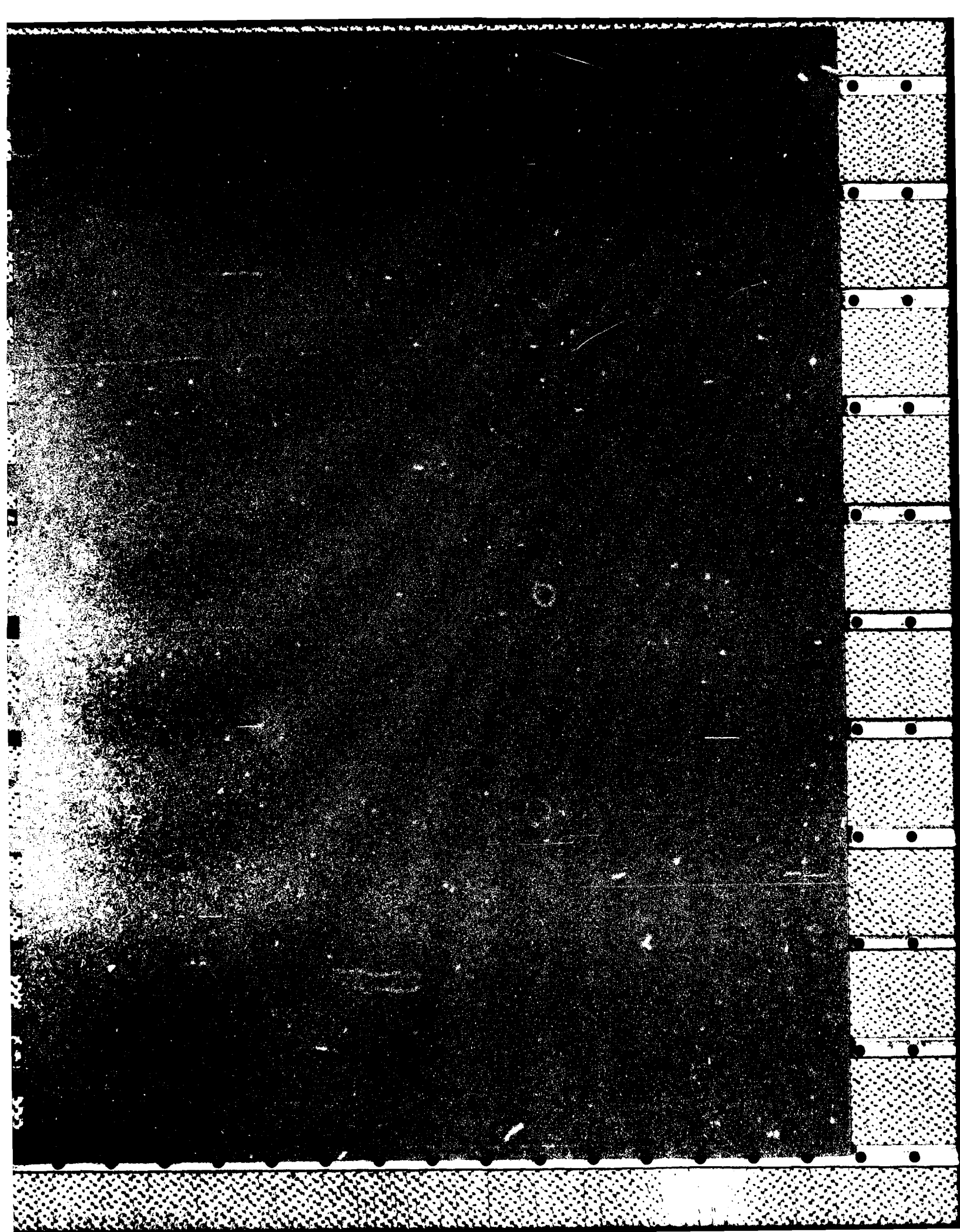
$$WD = 1355 \text{ ft.}$$

$$Q_{110} = 43780 \text{ cfs capacity}$$

$$\text{Volume} = \frac{0.419 \text{ ft} \times 1400'}{13560} = 206 \text{ Acre-ft}$$

$$5^{1/2} \text{ Acre-ft}$$

The Flow from dam failure has already been stored by reaches



END

FILMED

7-85

DTIC